



K.K.Wagh Institute of Engineering Education and Research, Nashik
FYMCA (Autonomous Syllabus 2026 Pattern)



**K.K. Wagh Institute of Engineering
Education and Research, Nashik**

**MCA Programme Structure
(As per NEP 2020)**

w. e. f.: A.Y. 2026-2027



K.K.Wagh Institute of Engineering Education and Research, Nashik
FYMCA (Autonomous Syllabus 2026 Pattern)

Summary of Credits and Total Marks for MCA Programme :

Semester	Credits	Marks
I	22	700
II	22	700
III	22	700
IV	22	500
Total	88	2600

Definition of Credit :

The Under Graduate (U.G.) and Post Graduate (P.G.) programmes will have credit system. The details of credit will be as follow

1 **Credit** = 1 hour/week for lecture
= 2 hours/week for practical
= 1 hour /week for tutorial

- Abbreviations: TH: Theory, PR: Practical, TU: Tutorial, OR: Oral, TW: Term work, INT: Internal Evaluation , EXT: External Evaluation

• **Description of various Courses:**

Type of Course	Description	Type of Course	Description
PCC	Programme Core Course	OJT	On Job Training / Internship
PEC	Programme Elective Course	RP	Research Project
RM	Research Methodology	AEC	Ability Enhancement Course
HSSM	Humanities, Social Science and Management	VSEC	Vocational and Skill Enhancement Course



K.K.Wagh Institute of Engineering Education and Research, Nashik
FYMCA (Autonomous Syllabus 2026 Pattern)

Details of Course Structure: First Year MCA (2026 Pattern) Semester: I

Course Code	Course Type	Title of Course	Teaching Scheme Hrs./week			Evaluation Scheme and Marks								Credits			
			T H	T U	P R	In Sem	End Sem	CC E	T U	T W	P R	O R	Total	T H	T U	P R	Total
2609501	PCC	Discrete Mathematics	3	-	-	20	50	30	-	-	-	-	100	3	-	-	3
2609502	PCC	Data Structures and Algorithms	3	-	4	20	50	30	-	25	50	-	175	3	-	2	5
2609503	PCC	Web Technologies	3	-	-	20	50	30	-	-	-	-	100	3	-	-	3
2609504	PEC	Elective-I	3	-	-	20	50	30	-	-	-	-	100	3	-	-	3
2609505	RM	Research Methodology	3	-	-	20	50	30	-	-	-	-	100	3	-	-	3
2609506	PCC	Computer Lab	-	1	2	-	-	-	25	25	-	-	50	-	1	1	2
2609507	PCC	Python Programming	-	-	2	-	-	-	-	25	-	-	25	-	-	1	1
2609508	AEC	Digital Communication and Presentation Lab	-	-	2	-	-	-	-	25	-	-	25	-	-	1	1
2609509	HSS M	MOOC-I on Human Rights	1	-	-	-	-	25	-	-	-	-	25	1	-	-	1
Total			16	1	10	100	250	200	25	75	50	0	700	16	1	5	22

Elective -I

Course Code	Title of Course
2609504A	Cloud Computing
2609504B	UI-UX Design
2609504C	Green IT



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Details of Course Structure: First Year MCA (2026 Pattern) Semester: II

Course Code	Course Type	Title of Course	Teaching Scheme Hrs./week			Evaluation Scheme and Marks								Credits			
			T H	T U	P R	In Sem	End Sem	CC E	T U	T W	P R	O R	Total	T H	T U	P R	Total
2609511	PCC	Artificial Intelligence	3		-	20	50	30	-	-	-	-	100	3		-	3
2609512	PCC	Database Systems and NoSQL	3	-	4	20	50	30	-	25	50	-	175	3	-	2	5
2609513	PCC	Cyber Security	3	-	2	20	50	30	-	25	-	-	125	3	-	1	4
2609514	PEC	Elective-II	3	-	-	20	50	30	-	-	-	-	100	3	-	-	3
2609515	HSS M	Management Information System	3	-	-	20	50	30	-	-	-	-	100	3	-	-	3
2609516	AEC	Technical Seminar	-	-	2	-	-	-	-	25	-	-	25	-	-	1	1
2609517	OJT	On Job Training / Industrial Internship	-	-	-	-	-	-	-	25	-	25	50	-	-	2	2
2609518	AEC	MOOC-II on Human Rights	1	-	-	-	-	25	-	-	-	-	25	1	-	-	1
		Total	16	0	8	100	250	175	0	100	50	25	700	16	0	6	22

Elective -II	
Course Code	Title of Course
2609514A	Operation Research
2609514B	Operating System
2609514C	Emerging Technologies



Course Code	2609501						
Course Name	Discrete Mathematics						
Type of Course	Major Core						
Teaching Scheme and Credits	TH(Hrs.)	TU(Hrs.)		PR(Hrs.)		Total Credits	
Weekly Working Hrs	3	-		-		3	
Assessment Scheme	CCE	TW	PR	OR	ISE	ESE	Total (Marks)
(Marks)	30	-	-	-	20	50	100

Prerequisites for the Course: Nil

The course aims to:

Course Objectives	Description
1	To develop logical thinking and its application to computer science
2	To study use of set, relation and function models to solve practical problems
3	To learn fundamental counting principle, permutation and combinations

On completion of the course, learner will be able to–

Course Outcomes	Description	Bloom's Level
CO1	Apply the fundamental concepts of set theory, propositional logic, and mathematical induction to solve problems related to discrete structures and logical reasoning.	03-Apply
CO2	Apply the concepts of relations, functions, counting principles, permutations, and combinations to model and solve computational problems.	03-Apply
CO3	Analyze the properties of graphs and trees to determine suitable representations and solutions for computational and real-world problems.	04-Analyze
CO4	Analyze and interpret different graph structures, graph algorithms, paths, circuits, and graph coloring techniques for problem-solving applications.	04-Analyze
CO5	Evaluate appropriate discrete mathematical techniques, including graph algorithms, tree structures, and cryptographic foundations, for solving computing and information security problems.	05-Evaluate

Course context, Relevance, Practical Significance:

Discrete Mathematics provides the mathematical foundation required for computer science and information technology. It introduces concepts such as logic, sets, relations, functions, graph theory, combinatorics, and discrete probability that are essential for algorithm design, programming, database systems, and network analysis. The subject develops logical reasoning and problem-solving skills, enabling students to model and solve real-world computational problems efficiently. It also forms the basis for advanced areas such as artificial intelligence, cryptography, data structures, and software engineering.

Course Contents:

Unit	Contents	Lecture Hours	Cos Mapped
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1	Set Theory Introduction: History of mathematics as related to discrete structure, motivations for discrete Structure, Sets: introduction, combination of sets, finite and infinite sets, uncountable infinite sets, Principle of inclusion/exclusion (addition principle). Propositional Logic -Introduction, Propositional Equivalences, Application of Propositional Logic- Translating English Sentences, Proof by Mathematical Induction Structural Analytical Reasoning :Deductive and Inductive reasoning , Constraint based reasoning using propositional logic, Ethical reasoning and responsible data classification (Recommended AI tool -Mathos AI, URL: https://www.mathgptpro.com/)	7	CO1
2	Relations: Definitions, properties of binary relation, Applications of relation, Relation representation, equivalence relation, partial ordering relations, Hasse diagram, closure of relations, Warshall's algorithm, Functions: Subjective, Injective and Bijective functions, Inverse Functions and composition of functions, The Pigeonhole Principle (Recommended AI tool -CompSciLib, URL: https://www.compsclib.com/)	7	CO2
3	Permutations and Combinations: Rules of sum and products, counting principle, permutations, combinations, generations of permutations and combinations	8	CO3
4	Graphs: Basic terminology, Types of graphs, Graph representation, Graph isomorphism, paths and Circuits, Responsible network analysis and ethical optimization ,shortest path in weighted graphs, Hamiltonian and Eulerian paths and circuits, Graph coloring, Case Study-Web Graph	7	CO4
5	Trees: Introduction, rooted trees, path length in rooted trees, prefix codes and optimal prefix codes, binary search trees, tree traversals, spanning trees, minimal spanning trees, Sustainable and responsible optimization of networks , Kruskal's and Prim's algorithms for minimal spanning tree Case Study- Simple FAQ Chatbot (Use a binary tree where each internal node is a decision (question and each leaf is an outcome)	7	CO5
References Books 1. Kenneth H. Rosen, "Discrete Mathematics and its Applications", Tata McGraw-Hill, ISBN 978-0- 07-288008-3, 7th Edition. 2. Sriram P & Steven S, "Computational Discrete Mathematics", Cambridge University Press, ISBN 13: 978-0-521-73311-3 1. J. Tremblay, Manohar R., "Discrete Mathematical Structures with application to Computer Science", Tata McGraw-Hill, 2002 ISBN 0-07-463113-6			



Text Books

1. N. Biggs, "Discrete Mathematics", 3rd Edition, Oxford University Press, ISBN 0 –19 850717 –8.
1. C. L. Liu, "Elements of Discrete Mathematics", TMH, ISBN 10:0-07-066913-9

e Resources

1. <https://nptel.ac.in/>
2. <https://ocw.mit.edu/>
3. <https://www.geeksforgeeks.org/discrete-mathematics-tutorial/>
4. <https://mathworld.wolfram.com/>
https://www.tutorialspoint.com/discrete_mathematics/index.htm

Useful websites / Video

- <https://www.youtube.com/watch?v=QVKj3LADCnA>
- <https://www.youtube.com/watch?v=JLO5-IbJYD4>
- <https://www.youtube.com/watch?v=RBSGKlAvoiM>
- <https://www.youtube.com/watch?v=Y0ZQw4xM6hQ>
- <https://www.youtube.com/watch?v=VGRD2B7xj4Y>
- <https://www.youtube.com/watch?v=7c08j7nJq0E>
- <https://www.youtube.com/watch?v=zaJfM7x6xQ0>
- <https://www.youtube.com/watch?v=JQBRzsPhw2w>
<https://www.youtube.com/watch?v=Kc0EWRh2Y4I>

Strength of CO - PO/PSO Mapping (Sample): Attainment of a PO/PSO depends both on the attainment levels of associated COs of courses and the strengths to which it is mapped

- Each Course Outcome addresses a sub-set of POs and PSOs to varying levels (strengths: 1- Low, 2 – Medium, 3 - Strong).

Strength of COs	Strength of CO-PO Mapping							
	PO							
	1	2	3	4	5	6	7	8
CO1	3	2	2	-	-	-	2	2
CO2	2	3	2	1	-	1	-	1
CO3	1	3	1	1	1	-	-	-
CO4	2	2	3	2	1	2	1	-
CO5	2	2	3	2	1	2	-	-

Guidelines for Continuous Comprehensive Evaluation of Theory Course

Sr. No.	Components for Continuous Comprehensive Evaluation	Marks Allotted
1	Assignments - 1	6
2	Quiz - 1	6
3	Open Book Test	6
4	Assignments - 2	6
5	Quiz - 2	6
	Total	30



Course Code	2609502						
Course Name	Data Structures and Algorithms						
Type of Course	Major Core						
Teaching Scheme and Credits	TH(Hrs.)	TU(Hrs.)		PR(Hrs.)		Total Credits	
Weekly Working Hrs	03	-		04		05	
Assessment Scheme (Marks)	CCE	TW	PR	OR	ISE	ESE	Total (Marks)
	30	25	50	-	20	50	175

Prerequisites for the Course:

1. Basic knowledge of programming in C/C++ or any high-level language
2. Understanding of variables, data types, and operators
3. Familiarity with control structures (loops and decision-making statements)
4. Basic understanding of functions and arrays
5. Logical thinking and problem-solving skills

The course aims to:

Course Objectives	Description
1	To develop a foundation in algorithm analysis, data organization, and code optimization techniques for efficient computational solutions.
2	To develop the ability to implement and utilize dynamic linear data structures for efficient memory management and data manipulation.
3	To develop problem-solving skills through the implementation and application of stack and queue-based data structures.
4	To develop the ability to analyze and apply non-linear data structures and traversal techniques to solve complex problems.
5	To develop the ability to evaluate and optimize searching and sorting algorithms based on computational efficiency and application requirements.

On completion of the course, learner will be able to–

Course Outcomes	Description	Bloom's Level
CO1	Apply algorithm analysis and code optimization techniques to implement efficient solutions using appropriate data organization methods.	L3 – Apply
CO2	Implement appropriate linked-list structures and operations to solve dynamic data management problems efficiently.	L3 – Apply
CO3	Apply stacks and queues to design solutions for problems involving expression processing, recursion, scheduling, and sequential data handling.	L3 – Apply
CO4	Analyze and apply tree and graph data structures and traversal algorithms to solve real-world problems.	L4 – Analyze
CO5	Evaluate and optimize searching and sorting techniques by comparing their performance and selecting suitable algorithms for large-scale data processing.	L5 – Evaluate

Course context, Relevance, Practical Significance: The Data Structures and Algorithms course provides fundamental knowledge of organizing and processing data efficiently using linear and non-linear structures, forming a strong base for advanced computing subjects. The



course is essential for developing problem-solving, algorithm design, and optimization skills required in software development, AI, data analytics, and other industry applications. Through implementation-based assignments such as stacks, queues, trees, graphs, searching, and sorting, students gain hands-on experience in solving real-world problems and improving programming skills.

Course Contents:

Unit	Contents	Lecture Hours	Cos Mapped
1	Data Structures and Algorithm fundamentals Algorithms: Introduction to Algorithms, Analysis of Algorithms, Space complexity, Time complexity, Asymptotic notation- Big-O, Theta and Omega. Introduction to Code Optimization: writing efficient code, eliminating redundant computations, minimizing memory usage, loop optimization, function optimization, recursion vs iteration, selecting appropriate data structures for better performance, basic profiling and benchmarking concepts, Introduction to data structures, Abstract Data types (ADT), Linear data structures using sequential organization: Concept of sequential organization, Concept of Linear data structures, arrays as ADT, Multidimensional arrays, Storage representations (row major and column major). Application of array in sparse matrix representation, addition and transpose, Algorithm efficiency in real-world systems (web apps, databases) (Suggested AI tools: ChatGPT, GitHub Copilot, Gemini)	8	CO1
2	Linked Lists Concept of linked organization, singly linked list, doubly linked list, circular linked list and operations on it. Application of linked list for Representation and manipulations of polynomials, Memory-efficient applications, memory optimization in linked list, Dynamic data handling in real systems (Suggested AI tools : ChatGPT, GitHub Copilot, Claude)	7	CO2
3	Stacks and Queues Concept of stack and queues as ADT, Implementation of stacks using sequential and linked organization, linear queue, circular queue using sequential and linked organization, Priority Queue, Deque, Application of stack for expression conversion, evaluation, recursion and backtracking Application of queue in job scheduling, Call center systems (Queue), Undo/Redo operations (Stack), Stack vs Queue implementation efficiency, recursion optimization (Suggested AI tools: ChatGPT, GitHub Copilot, Gemini)	7	CO3
4	Trees and Graphs Introduction, concepts and basic terminologies. Sequential	7	CO4



	& Linked representation of trees and graphs. Algorithm for tree and graph traversals, Space-efficient tree and graph representations, traversal optimization, Applications of trees and graphs, Social networks (Graph), Recommendation systems, Case Study-Friend suggestion algorithm, (Suggested AI tools : Graph visualization tools, Napkin AI, ChatGPT, Graphviz AI / Mermaid AI)		
5	Searching and Sorting Sequential, binary and Fibonacci search. General concepts: sort order, sort stability, efficiency and passes, Internal and external sorting, Bubble sort, Quick sort, Merge sort, Heap sort, Search engines, E-commerce product sorting, Big data handling, Case Study-Product ranking system, Code optimization using searching and sorting algorithms, comparative performance analysis, optimization of search and sort operations for large datasets, benchmarking and profiling of algorithms, AI-assisted optimization and code refactoring techniques. (Suggested AI tools: GitHub Copilot, ChatGPT, Claude)	7	CO5

References Books

1. A. Aho, J. Hopcroft, J. Ulman, "Data Structures and Algorithms", Pearson Education, 1998, ISBN-0-201-43578-0
2. G A V Pai, "Data Structures and Algorithms", McGraw-Hill Companies, ISBN - 9780070667266

Text Books

1. Horowitz E., Sahani S., "Fundamentals of Data structures in C"
2. Y. Langsam, M. Augenstein, A. Tannenbaum, "Data Structures using C and C++", 2nd Edition, Prentice Hall of India, 2002, ISBN-81-203-1177-9

Strength of CO - PO/PSO Mapping (Sample): Attainment of a PO/PSO depends both on the attainment levels of associated COs of courses and the strengths to which it is mapped
 • Each Course Outcome addresses a sub-set of POs and PSOs to varying levels (strengths: 1- Low, 2 – Medium, 3 - Strong).

Strength of CO-PO Mapping								
Strength of COs	PO							
	1	2	3	4	5	6	7	8
CO 1	3	3	2	3	–	–	1	2
CO 2	3	2	3	2	1	–	1	2
CO 3	3	3	3	2	1	1	1	2
CO 4	3	3	3	3	1	–	1	3
CO 5	3	3	3	3	1	–	1	3

Guidelines for Continuous Comprehensive Evaluation of Theory Course

Sr. No.	Components for Continuous Comprehensive Evaluation	Marks Allotted
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1	Assignments - 1	6
2	Quiz - 1	6
3	Open Book Test	6
4	Assignments - 2	6
5	Quiz - 2	6
	Total	30

List of Laboratory Experiments / Assignments		
Sr. No.	Laboratory Experiments / Assignments	CO Mapped
1	Write a program to represent a sparse matrix using array and perform transpose. Compare performance for large datasets and analyze efficiency.	CO1, CO5
2	Write a menu-driven Book Management System that utilizes a singly linked list to handle operations such as adding, removing, and displaying books, as well as searching for specific books and counting the total number of books available.	CO2
3	Implement a Car Management System using Doubly Linked List which will maintain a list of car models, their price, name of the manufacture, engine capacity etc. as a doubly linked list. The menu should make provisions for inserting information pertaining to new car models, delete obsolete models, update data such as price besides answering queries such as listing all car models within a price range specified by the client and listing all details given a car model	CO2
4	Write a program to implement stack as an ADT. Use this ADT to perform expression conversion and evaluation. (Infix – Postfix)	CO3
5	Develop a Customer Support Ticket System. Utilize a circular queue implemented using arrays to handle incoming support requests. Each ticket represents a customer support request, ensuring memory-efficient management. Implement features for ticket submission, processing, and displaying the current queue status	CO3
6	Implement a Contact Management System using Binary Search Tree (BST) with insert, delete, search, and traversal. Extend with balancing concept discussion.	CO4
7	Represent a city map as a graph using adjacency list/matrix and perform DFS and BFS. Visualize traversal using tools or GUI.	CO4
8	Write a program to represent a graph of your city using adjacency matrix /adjacency list. Nodes should represent the various areas in the city and links should represent the distance between them. Find the shortest path of your college from your home using Dijkstra's algorithm	CO4, CO5
9	Develop a Student Database System. Database contains different fields of student like Roll No, Name and percentage. Search a particular student according to roll number using binary search. Compare with linear search and analyze performance.	CO5



10	Write a program to arrange list of students to find out first ten toppers from a class using Bubble sort. (refer the student database given in assignment 10)	CO5
11	Write a program to sort a list of sales data for a retail company. Each record represents sales and contains the following information: sales ID, customer name, product name, quantity sold, and total sale amount. sort the sales data based on the total sale amount in descending order using the Merge Sort algorithm. / Quick sort method	CO5

Guidelines for Laboratory Conduction

1. Use of open-source software is encouraged.
2. Instructor should identify and set one assignment beyond the scope of syllabus.
3. Operating System recommended: - Windows / Open source Linux or its derivative

Guidelines for Student's Lab Journal

1. The laboratory assignments are to be submitted by students in the form of journal.
2. Journal consists of certificate, table of contents, and handwritten write-up of each assignment (Title, Objectives, Problem Statement, Outcomes, Date of Completion, assessor's sign, Theory-Concept in brief, algorithm, flowchart, conclusion.).
3. Program codes with sample output of all performed assignments are to be submitted as softcopy.
4. Course in-charge is highly encouraged to maintain soft copy of all the students' assignments

Guidelines for Term work Assessment

Continuous assessment of laboratory work is done based on overall performance of students. Each lab assignment assessment will assign marks based on rubrics. Suggested rubrics for overall assessment include-

Sr. No.	Components for Continuous Assessment	Marks Allotted
1	R1: Timely Submission	10
2	R2: Understanding	10
3	R3: Clarity of Journal Writing	10
Total Marks:		30
Each assignment will get 30 marks. Average of all assignments is converted in to total TW marks		



Course Code	2609503						
Course Name	Web Technologies						
Type of Course	Major Core						
Teaching Scheme and Credits	TH(Hrs.)	TU(Hrs.)		PR(Hrs.)		Total Credits	
Weekly Working Hrs	03	--		--		03	
Assessment Scheme (Marks)	CCE	TW	PR	OR	ISE	ESE	Total (Marks)
	30	-	-	-	20	50	100

Prerequisites for the Course:

1. Basics of Programming Language

The course aims to:

Course Objectives	Description
CO1	To make students aware of the fundamentals of web technologies and HTML5 for developing web pages.
CO2	To familiarize students with designing responsive and structured web pages using HTML5 and CSS3.
CO3	To help students learn client-side scripting techniques using JavaScript and DOM manipulation.
CO4	To get students acquainted with server-side web application development using PHP and database connectivity.
CO5	To introduce students to modern web application concepts such as JSON and API-based data communication.

On completion of the course, learner will be able to–

Course Outcomes	Description	Bloom's Level
CO1	Implement responsive and interactive web pages using HTML5, CSS3, and responsive design principles.	3 – Apply
CO2	Examine client-side scripting techniques using JavaScript, DOM manipulation, and event-driven programming for developing interactive web applications.	4 – Analyze
CO3	Integrate server-side programming, database connectivity, and secure coding practices to develop dynamic web applications.	4 – Analyze
CO4	Assess XML and JSON data representation techniques for efficient data exchange in web applications.	5 – Evaluate
CO5	Construct modern web applications using REST/GraphQL APIs, modern web frameworks, version control, and deployment concepts.	6 – Create

Course context, Relevance, Practical Significance:

Web Technologies is a fundamental course that equips students with the knowledge and skills required to design, develop, and deploy modern web applications. The course covers both client-side and server-side development using industry-relevant technologies such as HTML5, CSS3, JavaScript, PHP, MySQL, XML, JSON, REST APIs, and version control. It emphasizes responsive design, secure coding practices, and modern web development frameworks while integrating AI-assisted development tools to enhance productivity. The practical knowledge



gained through this course enables learners to build scalable, interactive, and secure web applications, preparing them for careers in full-stack web development, software engineering, and digital application development.

Course Contents:

Unit	Contents	Lecture Hours	COs Mapped
Unit 1	Web Fundamentals and HTML5: Introduction to Web Technologies, Web Architecture, client-server model, HTTP/HTTPS basics; Client-Server Communication Models, HTML5 document structure, semantic tags, DOM Tree and Semantic DOM Structures, headings, lists, tables, hyperlinks, images, forms and input elements; multimedia (audio/video); real-world website analysis Cascading Style Sheets and Responsive Design: CSS types (inline, internal, external), syntax and selectors; box model, margins, padding, borders; text and font properties; positioning and layout; Flexbox and Grid; media queries; responsive design principles; UI/UX basics; UI design tools and responsive layout development Recommended AI Tool: Wix AI, Figma AI, Uizard AI	7	CO1
Unit 2	Client-Side Programming using JavaScript: JavaScript fundamentals (variables, data types, operators); control structures; Looping statement, functions, scope, arrays, strings; DOM manipulation; event handling; form validation; dialog boxes; ES6 features; debugging techniques; browser developer tools and debugging for interactive applications Recommended AI Tool: ChatGPT, Replit AI, CodePen AI	7	CO2
Unit 3	Server-Side Programming with PHP: PHP syntax and program structure; variables, data types, control statements; arrays, functions, string handling; sessions and cookies; file handling; form processing; database connectivity using PHP and MySQL; CRUD operations; Frontend and Backend Plumbing, secure coding practices, Code Optimization and real-world backend application development Recommended AI Tool: GitHub Copilot, ChatGPT	7	CO4
Unit 4	Introduction to XML and JSON; syntax, elements, attributes, namespaces, XML schema, DTD, XML parsing techniques; JSON objects, arrays, key-value pairs, JSON parsing and validation; comparison between XML and JSON; data representation and exchange in web applications; integration of XML and JSON with client-side and server-side applications; implementation of structured	7	CO3



	data handling techniques in web environments. Recommended AI Tool: ChatGPT, Gemini, Perplexity AI, Bruno AI		
Unit 5	Modern Web Application Concepts: JSON syntax and data types; JSON parsing and usage; API concepts and REST basics; GraphQL and FastAPI; frontend-backend integration using REST/GraphQL APIs; version control using Git (repository, commit, push); overview of modern web frameworks; Microservices architecture; Enterprise Application Development; web security basics; deployment concepts; development of a simple web application. Recommended AI Tool: Postman AI, GitHub Copilot	8	CO5

References Books

1. Jeffrey C. Jackson, Web Technologies – A Computer Science Perspective, Pearson Education.
2. Steven Holzner, HTML5 Black Book: Covers CSS3, JavaScript, XML, XHTML, AJAX, PHP, Dreamtech Press.
3. Eric Freeman and Elisabeth Robson, Head First HTML and CSS, O'Reilly Publications.

Text Books

1. Robin Nixon, Learning PHP, MySQL & JavaScript with jQuery, CSS & HTML5, O'Reilly Publications.
2. Jon Duckett, HTML and CSS: Design and Build Websites, John Wiley & Sons.
3. Jon Duckett, JavaScript and jQuery: Interactive Front-End Web Development, Wiley Publications

e Resources

- MDN Web Docs (Mozilla Developer Network) – Comprehensive documentation for HTML, CSS, JavaScript and modern web technologies. <https://developer.mozilla.org/en-US/>
- W3Schools Web Development Tutorials – Interactive tutorials and examples for HTML, CSS, JavaScript, PHP, JSON and APIs. <https://www.w3schools.com/>

Useful websites / Video

- FreeCodeCamp Web Development Course (YouTube) – Complete tutorial covering HTML, CSS, JavaScript and responsive web design. <https://www.youtube.com/c/Freecodecamp>
- NPTEL Web Technology Course – Lecture series on web technologies by IIT faculty. <https://nptel.ac.in/courses/106105084>

Strength of CO - PO/PSO Mapping (Sample): Attainment of a PO/PSO depends both on the attainment levels of associated COs of courses and the strengths to which it is mapped

- Each Course Outcome addresses a sub-set of POs and PSOs to varying levels (strengths: 1- Low, 2 – Medium, 3 - Strong).

Strength of CO-PO Mapping								
Strength of COs	PO							
	1	2	3	4	5	6	7	8
CO 1	3	2	2	1	2	–	–	1
CO 2	2	3	3	2	3	–	–	1



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CO 3	2	3	3	2	3	–	–	1
CO 4	2	3	2	3	2	–	–	1
CO 5	2	3	3	3	3	1	1	2

Guidelines for Continuous Comprehensive Evaluation of Theory Course		
Sr. No.	Components for Continuous Comprehensive Evaluation	Marks Allotted
1	Assignment 1	6
2	Quiz 1	6
3	Assignment 2	6
4	Micro Project	6
5	Quiz 2	6
	Total	30



Course Code	2409504A						
Course Name	Cloud Computing						
Type of Course	Major Elective						
Teaching Scheme and Credits	TH(Hrs.)	TU(Hrs.)		PR(Hrs.)		Total Credits	
Weekly Working Hrs	3	-		-		3	
Assessment Scheme	CCE	TW	PR	OR	ISE	ESE	Total (Marks)
(Marks)	30	-	-	-	20	50	100

Prerequisites for the Course: Nil

The course aims to:

Course Objectives	Description
1	To understand cloud computing concepts, architecture, and modern industry practices
2	To explore cloud platforms, DevOps tools, and implement cloud-based solutions
3	To analyze cloud security, governance models, and emerging technologies using practical and AI-enabled approaches

On completion of the course, learner will be able to–

Course Outcomes	Description	Bloom's Level
CO1	Apply cloud computing concepts, service models, and industry best practices to solve real-world computing problems.	3- Apply
CO2	Apply virtualization techniques and cloud architecture concepts in real-world scenarios	3- Apply
CO3	Implement cloud-based solutions using DevOps tools, containers, and automation techniques	3- Apply
CO4	Analyze and compare cloud platforms and intelligent services	4- Analyze
CO5	Evaluate cloud security threats, governance models, and implement basic security configurations using cloud platforms	5- Evaluate

Course context, Relevance, Practical Significance:

This course provides foundational and advanced knowledge of cloud computing, covering architecture, platforms, DevOps tools, and security practices aligned with current industry needs. It emphasizes hands-on learning using tools like Amazon Web Services, Docker, and Kubernetes. The course prepares students for real-world roles by integrating practical implementation, case studies, and emerging technologies such as AI-enabled cloud services.

Course Contents:

Unit	Contents	Lecture Hours	Cos Mapped
1	Cloud Computing: Definition, Vision, Evolution, Cloud Reference Model, Characteristics and Benefits, Challenges	7	CO1



	in Cloud Computing, Multi-cloud & Hybrid Cloud, Green Cloud & FinOps (Cost Optimization), Case Study- Netflix: Scalable cloud infrastructure Suggested AI tools: ChatGPT, Google Gemini, Napkin AI		
2	Virtualization Concepts and Types, Taxonomy of Virtualization Techniques, Cloud Architecture (Logical & System Design), Deployment Models (Public, Private, Hybrid), Introduction to Amazon EC2, Microservices & Event-driven Architecture, Practical Application- Create and manage Virtual Machine (AWS EC2 / VirtualBox) Suggested AI tools: ChatGPT, Claude, Whimsical AI	7	CO2
3	DevOps Engineering, Containerization: Docker, Container Orchestration: Kubernetes, Serverless Computing Concepts, CI/CD: Jenkins, GitHub Actions & Terraform, Case Study - Spotify: Docker-based deployment, Practical Application- Build and deploy containerized application using Docker Suggested AI tools: GitHub Copilot, ChatGPT, Docker AI Assistant	8	CO3
4	AWS: EC2, S3, SimpleDB, DynamoDB, Microsoft Azure: Core Concepts, SQL Azure, Site Reliability Engineering, Serverless Computing (AWS Lambda), Introduction to AI Services in Cloud, Case Study - Amazon Cloud Architecture (EC2 + S3 + DynamoDB), Practical Application - Deploy a simple web application on cloud platform Suggested AI tools: Amazon Q Developer, GitHub Copilot, Microsoft Copilot	7	CO4
5	Cloud Security Challenges, Threat Agents & Security Threats, Zero Trust Security Model, Shared Responsibility Model, Economics of Cloud Computing, Emerging Trends: Fog, Edge, Mobile Cloud, AI in Cloud Security, Hands-on security implementation using AWS Educate (IAM, S3 security, access control) Suggested AI tools: Microsoft Security Copilot, Amazon Q Developer, ChatGPT	7	CO5

References Books

1. Rajkumar Buyya, "Cloud Computing Principles and Paradigms", Wiley
2. Ricardo Puttini, Thomas Erl, Zaigham Mahmood, "Cloud Computing: Concepts, Technology and Architecture", Prentice Hall, 1st Edition, 2013
3. Zaigham Mahmood, "Cloud Computing: Challenges, Limitations and R&D Solutions", Springer International Publishing, 1st edition, 2014
4. Dr. Kris Jamsa, "Cloud Computing: SaaS, PaaS, IaaS, Virtualization, Business Models, Mobile, Security and more", Wiley Publications, ISBN:978-0-470-97389-9
5. Anthony Velte, Robert Elsenpeter, Toby J. Velte, "Cloud Computing: A Practical Approach", 2010, The McGraw Hill.
6. Shahid Latif, Subra Kumarswamy, Tim Mather, "Cloud Security and Privacy", Oreilly,



ISBN-13: 978-81-8404-815-5

8. Jennifer Davis and Katherine Daniels, "Effective DevOps: Building a Culture of Collaboration, Affinity, and Tooling at Scale", O'Reilly Media, Inc., ISBN: 978-1-491-92630-7
9. Sanjeev Sharma and Bernie Coyne, "DevOps for Dummies", John Wiley & Sons, Inc., 2nd IBM Limited Edition, ISBN: 978-1-119-04705-6

Text Books

1. Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi, "Mastering Cloud Computing", McGraw Hill Education, ISBN-13:978-1-25-902995-0
2. Rajkumar Buyya, Christian Vecchiola, "Mastering Cloud Computing Foundations and Applications Programming", Morgan Kaufmann, 2nd Edition, 2013.
3. A. Srinivasan, J. Suresh, "Cloud Computing: A Practical Approach for Learning and Implementation", Pearson, ISBN: 978-81-317-7651-3
4. Viktor Farcic, "The DevOps 2.0 Toolkit: Automating the Continuous Deployment Pipeline with Containerized Microservices", CreateSpace Independent Publishing Platform; 1st edition

e Resources

1. <https://aws.amazon.com/education/awseducate/>
2. <https://www.virtualbox.org/>
3. <https://www.docker.com/>

Useful websites / Video

- <https://www.youtube.com/watch?v=RWgW-CgdIk0>
- https://www.youtube.com/watch?v=8sNAPqJ_c7c
- <https://www.youtube.com/watch?v=Esjx-hKyMRk>
- <https://www.youtube.com/watch?v=GQ0rfq6FWbw>
- <https://www.youtube.com/watch?v=w-3wnG3J1Rs>
- <https://www.youtube.com/watch?v=nSZfrttnzw>
- <https://www.youtube.com/watch?v=eUPWfEH2tbI>
- <https://www.youtube.com/watch?v=GQ0rfq6FWbw>
- <https://www.youtube.com/watch?v=XsRBDJ5hcdg>
- <https://www.youtube.com/watch?v=sF014G2BUXM>

Strength of CO - PO/PSO Mapping (Sample): Attainment of a PO/PSO depends both on the attainment levels of associated COs of courses and the strengths to which it is mapped

- Each Course Outcome addresses a sub-set of POs and PSOs to varying levels (strengths: 1- Low, 2 – Medium, 3 - Strong).

Strength of CO-PO Mapping								
Strength of COs	PO							
	1	2	3	4	5	6	7	8
CO 1	3	2	2	2	1	-	-	2
CO 2	2	3	3	3	1	-	-	2
CO 3	2	2	3	3	2	2	1	2
CO 4	2	3	2	3	1	1	-	2
CO 5	2	3	2	3	1	1	3	2



Guidelines for Continuous Comprehensive Evaluation		
Sr. No.	Components for Continuous Evaluation	Marks Allotted
1	Assignment -1	6
2	Quiz-1	6
3	Assignment - 2	6
4	Group Presentation	6
5	Quiz-2	6
	Total	30



Course Code	2609504B						
Course Name	UI-UX Design						
Type of Course	Major Elective						
Teaching Scheme and Credits	TH(Hrs.)	TU(Hrs.)		PR(Hrs.)		Total Credits	
Weekly Working Hrs	3	-		-		3	
Assessment Scheme	CCE	TW	PR	OR	ISE	ESE	Total (Marks)
(Marks)	30	-	-	-	20	50	100

Prerequisites for the Course: Nil

The course aims to:

Course Objectives	Description
1	To understand the factors influencing how users interact with technology
2	To learn the design of usable and user-friendly software interfaces
3	To ensure efficient, effective, and safe user interaction with systems
4	To enhance students' ability to design technology-driven, accessible, and user-friendly solutions

On completion of the course, learner will be able to–

Course Outcomes	Description	Bloom's Level
CO1	Implement user interface and user experience principles	3 – Apply
CO2	Apply strategies for managing design projects	3 – Apply
CO3	Analyze the quality of service and data visualization	4 – Analyze
CO4	Assess the data-driven UI designs and user experiences	5 – Evaluate
CO5	Develop the usability of a design through usability evaluations	6 – Create

Course context, Relevance, Practical Significance:

This course introduces students to the principles of UI/UX design that are widely used in modern software and product development. It emphasizes human-centred design, usability evaluation, and practical interface design using modern tools such as Figma and AI-based design assistants. The course prepares students for roles in product design, web development, and digital interface development.

Course Contents:

Unit	Contents	Lecture Hours	Cos Mapped
1	The Human –I/P, O/P channels, Human Interaction with Emerging Technologies (AI, voice, smart devices), Human Memory, thinking, emotion, individual difference (diversity), Introduction to User experience and user interaction-Usability of interactive systems, goals and Measures, guidelines, User Experience- Concept of UX, Trends in UX, 6 Stages used to UX design, Applications of UX design. Recommended AI- tool: ChatGPT, Gemini	7	CO1
2	Organizational design to support usability, pillars of design,	8	CO2



	development methodologies, Usability- principles to support usability, Usability problems, objective measures of usability, golden rules of interface design, Evaluating Interface Design –Introduction, Expert reviews, Usability testing, Acceptance tests, Legal issues- Privacy (data protection basics), Accessibility standards, Dark patterns & user trust, Recommended AI- tool: Microsoft Copilot		
3	Direct manipulation interfaces and virtual environments, along with modern interaction styles. Design of system menus and navigation including structure, content, labeling, and usability of graphical menus. Form design, dialog boxes, and user input methods. Interaction devices including touch, voice, and gesture-based systems. Recommended AI- tool: Figma AI / Figma Smart Features	7	CO3
4	Implementation support with user training and help systems. Window interface design (single and multiple windows). Basic screen controls like buttons, sliders, and tabs. Use of clear text, graphics, icons, and simple elements like tooltips and progress indicators. Recommended AI- tool: Framer.	7	CO4
5	Quality of service including response time, consistency, and its impact on user productivity. Information visualization covering data types, tasks, and challenges, along with use of dashboards and interactive visuals. Impact of user interfaces on individuals and society Recommended AI- tool: Framer.	7	CO5

References Books

1. Shneiderman, Plaisant, Cohen, Jacobs, “Designing the User Interface-Strategies for Effective Human Computer Interaction”, 5th Edition PEARSON Publication
2. Wilbert O. Galitz “The Essential Guide to User Interface Design”, 2nd Edition, WILEY Publication.
3. Alan Dix, Janet Finlay, Gregory D. Abowd, Russell Beale, “Human–Computer Interaction, 3rd Edition,
4. Alan Coopen, “The essentials of interaction”

Text Books

1. Creative Tim, “Fundamentals of Creating a Great UI/UX”, 1st Edition
2. Jon Yablonski, “Laws of UX: Using Psychology to Design Better Products & Services”, O'REILLY Publication.
3. Jenifer Tidwell, Charles Brewer, Aynne Valencia “Designing Interfaces: Patterns for Effective Interaction Design”, O'REILLY Publication.

E Resources

1. NPTEL – Human-Computer Interaction

Good for Indian university exam prep and theory answers. It covers HCI basics, usability, design process, evaluation, interaction styles, and UX.

https://nptel.ac.in/courses/106103220?utm_source=chatgpt.com

2. Coursera HCI module – directly includes direct manipulation, GUI, natural interfaces,



menus/forms https://www.coursera.org/learn/human-computer-interactions-odc?utm_source=chatgpt.com

3. **NPTEL HCI / HCI Design courses** – useful for implementation support and design issues

https://nptel.ac.in/courses/106103220?utm_source=chatgpt.com

https://nptel.ac.in/courses/106106701?utm_source=chatgpt.com

4. **NPTEL HCI course** – useful for design issues, performance, and evaluation
https://nptel.ac.in/courses/106103220?utm_source=chatgpt.com

Useful websites / Video

1. <https://selleo.com/blog/6-steps-of-uxui-design-process>
2. https://www.youtube.com/results?search_query=google+ux+design&utm_source=chatgpt.com
3. <https://www.calibrant.com/blog/user-acceptance-testing>
4. https://www.youtube.com/@Figma?utm_source=chatgpt.com <https://squashapps.com/blog/7-ways-ui-ux-design-services-improve-your-online-business/>
5. https://www.youtube.com/@NielsenNormanGroup?utm_source=chatgpt.com
6. https://www.youtube.com/@InteractionDesignFoundation?utm_source=chatgpt.com
7. <https://www.uxmatters.com/mt/archives/2023/03/the-intersection-of-data-visualization-and-ux-design.php>

Strength of CO - PO/PSO Mapping (Sample): Attainment of a PO/PSO depends both on the attainment levels of associated COs of courses and the strengths to which it is mapped
• Each Course Outcome addresses a sub-set of POs and PSOs to varying levels (strengths: 1- Low, 2 – Medium, 3 - Strong).

Strength of CO-PO Mapping								
Strength of COs	PO							
	1	2	3	4	5	6	7	8
CO1	2	2	1	2	1	-	1	2
CO2	1	2	2	-	-	-	1	2
CO3	2	3	2	2	-	-	1	2
CO4	2	3	3	3	-	-	1	3
CO5	1	3	2	2	2	1	2	2

Guidelines for Continuous Comprehensive Evaluation of Theory Course

Sr. No.	Components for Continuous Comprehensive Evaluation	Marks Allotted
1	Assignment 1	6
2	Quiz 1	6
3	Assignment 2	6
4	Group presentation	6
5	Quiz 2	6
	Total	30



Course Code	2609504C						
Course Name	Green IT						
Type of Course	Major Elective						
Teaching Scheme and Credits	TH(Hrs.)	TU(Hrs.)		PR(Hrs.)		Total Credits	
Weekly Working Hrs	03	-		-		03	
Assessment Scheme (Marks)	CCE	TW	PR	OR	ISE	ESE	Total (Marks)
	30	-	-	-	20	50	100

Prerequisites for the Course:

- Fundamentals of Computer Organization and Operating Systems
- Basic knowledge of Networking and Cloud Computing concepts
- Familiarity with software development and database management fundamentals

The course aims to:

Course Objectives	Description
1	To introduce the fundamentals of Green IT and sustainable computing
2	To learn energy-efficient computing practices and sustainable IT infrastructure
3	To provide knowledge of Green Software Engineering and environmentally responsible software development practices
4	To familiarize students with Green IT governance, sustainability standards, and e-waste management practices
5	To explore emerging Green IT technologies and their role in sustainable digital transformation

On completion of the course, learner will be able to–

Course Outcomes	Description	Bloom's Level
CO1	Explain the concepts and importance of Green IT, sustainable computing, and digital transformation for environmentally responsible IT practices	2 – Understand
CO2	Describe sustainable computing infrastructure, cloud technologies, and resource optimization techniques for energy-efficient IT operations	2 – Understand
CO3	Use Green Software Engineering principles and sustainable software development practices to design energy-efficient software applications	3 – Apply
CO4	Examine Green IT governance, sustainability standards, e-waste management practices, and regulatory frameworks for sustainable enterprise IT practices	4 – Analyze
CO5	Compare emerging Green IT technologies and propose sustainable digital solutions to address environmental and organizational sustainability challenges	4 – Analyze

Course context, Relevance, Practical Significance:

Green IT has become an essential component of modern computing, enabling organizations to



achieve sustainable digital transformation through energy-efficient technologies, Green Software Engineering, cloud sustainability, and environmentally responsible IT practices. This course equips MCA students with the knowledge and practical skills to develop sustainable software solutions, optimize computing resources, implement Green IT governance, and adopt environmentally responsible practices in enterprise IT environments. Through exposure to Green IT tools, sustainability frameworks, and emerging technologies, students will be prepared to design and implement sustainable digital solutions that support organizational objectives while contributing to global environmental sustainability.

Course Contents:

Unit	Contents	Lecture Hours	Cos Mapped
1	Green IT Foundations and Sustainable Digital Transformation: fundamental concepts and significance of Green Information Technology (Green IT) in promoting environmentally sustainable computing practices. It covers the evolution of Green IT, Green Computing, and Green ICT, emphasizing their role in reducing the environmental impact of digital technologies. Students will explore energy consumption in IT systems, carbon footprint, greenhouse gas emissions, digital pollution, and electronic waste. The unit further discusses Sustainable Development Goals (SDGs), Environmental, Social and Governance (ESG) principles, circular economy concepts, and global Green IT initiatives. Case studies of sustainable digital transformation adopted by leading IT organizations are also included to understand best practices in developing environmentally responsible IT solutions. Suggested AI-Enabled Tools / Software Platforms: EcoGrader ,Website Carbon Calculator ,SimaPro (Educational Version)	7	CO1
2	Sustainable Computing Infrastructure and Cloud Technologies This unit focuses on designing and managing sustainable computing infrastructure for modern IT environments. It introduces concepts of energy-efficient computing systems, Green Data Centers, virtualization, containerization, Green Networking, and cloud computing for sustainable resource utilization. Students will study cloud service models, virtualization techniques, workload scheduling, renewable energy integration, and resource optimization strategies for reducing energy consumption in enterprise computing environments. The unit also introduces cloud sustainability metrics, carbon footprint monitoring, and best practices adopted by major cloud service providers for building energy-efficient and environmentally sustainable computing infrastructure.	7	CO2



	Suggested AI-Enabled Tools / Software Platforms: Cloud Carbon Footprint (CNCF) ,Scaphandre ,Kepler (Kubernetes-based Efficient Power Level Exporter)		
3	Green Software Engineering and Sustainable Application Development This unit introduces the principles and practices of Green Software Engineering for developing sustainable software applications. It covers Sustainable Software Development Life Cycle (SSDLC), energy-aware software design, software carbon intensity, sustainable coding practices, algorithm optimization, memory management, and database query optimization for minimizing resource consumption. Students will learn techniques for designing energy-efficient applications, measuring software sustainability, and improving application performance through software optimization. The unit also introduces software sustainability metrics and practical approaches for developing environmentally responsible software solutions using modern software engineering practices. Suggested AI-Enabled Tools / Software Platforms: CodeCarbon ,EcoCode Plugin (SonarQube) ,Green Metrics Tool	7	CO3
4	Enterprise Green IT Governance and Circular Economy This unit focuses on implementing Green IT practices within organizations to support sustainable enterprise operations. It covers Green IT governance, sustainable procurement, IT asset lifecycle management, electronic waste (e-waste) management, reverse logistics, and circular economy principles for Information Technology. Students will study sustainability reporting, Green Key Performance Indicators (KPIs), Environmental, Social and Governance (ESG) practices, and environmental standards including ISO 14001, ISO 50001, Energy Star, EPEAT, RoHS, WEEE, and Extended Producer Responsibility (EPR). The unit also discusses organizational strategies, Green IT auditing, and enterprise roadmaps for achieving sustainable digital transformation. Suggested AI-Enabled Tools / Software Platforms: OpenLCA ,Boavizta Environmental Footprint Calculator, Climatiq API	7	CO4
5	Emerging Trends in Green IT and Sustainable Innovation This unit explores emerging technologies that support sustainable digital transformation and Green IT innovation. It introduces Green Artificial Intelligence, Sustainable Machine Learning, Green Internet of Things (IoT), Smart Cities, Smart Campuses, Digital Twins, Green DevOps,	8	CO5



	Sustainable Blockchain, Carbon-Aware Computing, Net Zero Computing, and carbon-neutral data centers. Students will examine the role of intelligent technologies in optimizing energy consumption, reducing environmental impact, and supporting sustainable enterprise solutions. The unit concludes with industrial case studies highlighting innovative Green IT practices and future trends in sustainable computing and digital transformation. Suggested AI-Enabled Tools / Software Platforms: Google Earth Engine ,Electricity Maps ,MLCO2 Impact Calculator		
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References Books

1. Carl Speshocky, “Empowering Green Initiatives with IT”, John Wiley & Sons
2. Alin Gălățeanu and Ioan Salomie, “Sustainable Computing and Green Technologies”, Springer
3. Tom Woolley, “Sustainable Development for Engineers”, Routledge
4. Daniel Minoli, “Building the Green Data Center”, Wiley
5. Richard Goodwin, “Green IT: Sustainable Strategies for the Modern Enterprise”, CRC Press

Text Books

1. Bud E. Smith, Green Computing: Tools and Techniques for Saving Energy, Money, and Resources, CRC Press.
2. San Murugesan and G. R. Gangadharan (Eds.), Harnessing Green IT: Principles and Practices, Wiley.
3. Bhuvan Unhelkar, Green IT Strategies and Applications: Using Environmental Intelligence, CRC Press.

e Resources

- Green Software Foundation – <https://greensoftware.foundation>
- Cloud Carbon Footprint – <https://www.cloudcarbonfootprint.org>
- CodeCarbon Documentation – <https://codecarbon.io>
- Google Sustainability – <https://sustainability.google>
- Microsoft Sustainability – <https://www.microsoft.com/sustainability>

Useful websites / Video

- NPTEL – <https://nptel.ac.in>
- SWAYAM – <https://swayam.gov.in>
- Google Cloud Sustainability – <https://cloud.google.com/sustainability>
- AWS Sustainability – <https://aws.amazon.com/sustainability>
- Green Software Foundation Learning Portal – <https://learn.greensoftware.foundation>
- Microsoft Learn – Sustainability Learning – <https://learn.microsoft.com/training>

Strength of CO - PO/PSO Mapping (Sample): Attainment of a PO/PSO depends both on the attainment levels of associated COs of courses and the strengths to which it is mapped

- Each Course Outcome addresses a sub-set of POs and PSOs to varying levels (strengths: 1- Low, 2 – Medium, 3 - Strong).

Strength of CO-PO Mapping								
Strength of COs	PO							
	1	2	3	4	5	6	7	8



K.K.Wagh Institute of Engineering Education and Research, Nashik
FYMCA (Autonomous Syllabus 2026 Pattern)

CO 1	3	2	–	–	–	–	2	2
CO 2	2	2	2	3	–	–	–	2
CO 3	2	3	3	3	–	–	2	2
CO 4	–	3	2	2	–	2	3	2
CO 5	–	3	3	2	2	–	2	3

Guidelines for Continuous Comprehensive Evaluation of Theory Course

Sr. No.	Components for Continuous Comprehensive Evaluation	Marks Allotted
1	Assignment -1	6
2	Quiz-1	6
3	Assignment - 2	6
4	Group Presentation	6
5	Quiz-2	6
	Total	30



Course Code	2609505						
Course Name	Research Methodology						
Type of Course	Research Methodology						
Teaching Scheme and Credits	TH(Hrs.)	TU(Hrs.)		PR(Hrs.)		Total Credits	
Weekly Working Hrs	03	-		-		03	
Assessment Scheme	CCE	TW	PR	OR	ISE	ESE	Total (Marks)
(Marks)	30	-	-	-	20	50	100

Prerequisites for the Course:

- Basic knowledge of mathematics, statistics, computer fundamentals, and data handling tools like Excel

The course aims to:

Course Objectives	Description
CO1	Explain fundamental research concepts, types, and methodologies with relevant examples
CO2	Formulate research problems, conduct literature review, and develop hypotheses using appropriate tools
CO3	Apply modeling and simulation techniques to solve research problems using computational tools
CO4	Analyze experimental data using statistical methods and interpret results for decision making
CO5	Evaluate research outcomes and prepare structured technical reports using appropriate tools and standards

On completion of the course, learner will be able to–

CO No	Revised Course Outcome	Bloom's Level
CO1	Use fundamental research concepts, research methodologies, and data collection techniques to solve research problems.	L3 – Apply
CO2	Examine research problems, literature, hypotheses, and ethical considerations for conducting systematic research.	L4 – Analyze
CO3	Investigate modeling and simulation techniques using computational tools to address research problems.	L4 – Analyze
CO4	Assess experimental data using statistical methods and optimization techniques to support research decision-making.	L5 – Evaluate
CO5	Construct structured technical reports by integrating research findings, technical communication, GitHub portfolio documentation, and appropriate research tools.	L6 – Create

Course context, Relevance, Practical Significance:

This course equips MCA students with systematic research skills required for identifying, analyzing, and solving real-world computing and interdisciplinary problems using scientific methods. It emphasizes research design, literature review, modeling, statistical analysis, AI-assisted research tools, and technical report writing to support innovation and evidence-based decision-making. The course also promotes ethical research practices, computational experimentation, and effective technical communication through GitHub portfolio development and project documentation. These competencies prepare learners for higher studies, industrial R&D, software development, data-driven research, and lifelong



professional learning in emerging technologies.

Course Contents:

Unit	Contents	Lecture Hours	COs Mapped
Unit 1	Introduction to Research: Meaning, objectives, motivation; Types of research (descriptive, analytical, applied, experimental); Research approaches; Methods of data collection (primary, secondary, APIs, datasets); Sampling techniques and sample design; Industry-based research examples and AI-assisted concept understanding Recommended AI Tool ChatGPT, Gemini, Canva AI, NotebookLM	07 hrs	CO1
Unit 2	Problem identification using case studies; formulation and refinement of research problems, literature review—importance, methods, sources, and systematic organization of literature, AI-based literature tools (Google Scholar, ChatGPT), identification of research gaps and development of research objectives and research questions, hypothesis formulation and testing, ethical issues and responsible use of AI in research. Recommended AI Tool: Elicit AI, Consensus AI, Scite AI, Perplexity AI	07 hrs	CO2
Unit 3	Modeling and Simulation: Mathematical modeling concepts; Classification of models; Modeling using differential equations; Simulation techniques (quantitative, statistical, computer-based); Use of tools (Python, Excel); Experimental modeling and design; AI-based simulation and visualization. Recommended AI Tool: Wolfram Alpha, ChatGPT, Google Colab AI (Gemini)	07 hrs	CO3
Unit 4	Experimental Design & Process Optimization: Variables (dependent, independent, control); Experimental design principles; Response surface methodology; First-order design; Taguchi method; Optimization techniques; Leadership and Team Management in research projects; AI-assisted experimental design and case studies (software/system performance). Recommended AI Tool: Julius AI, Microsoft Copilot, ChatGPT	07 hrs	CO4
Unit 5	Analysis of Results & Report Writing: Data types; Parametric and non-parametric tests; ANOVA, regression, clustering; Interpretation of results using real datasets; Research report writing (structure, format, references); Technical communication and presentation skills; Career readiness through research documentation and project presentation; GitHub portfolio development for research projects; Professional certifications for	08 hrs	CO5



	research and emerging technologies; AI-assisted report writing, plagiarism tools, and result validation. Recommended AI Tool: Grammarly AI, QuillBot, Scite AI, ChatGPT		
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References Books

1. P. L. Kandahar and T. S. Wilkinson, *Methodology and Techniques of Social Research*, Himalaya Publishing House, Mumbai.
2. William G. Cochran and Gertrude M. Cox, *Experimental Designs*, 2nd Edition, Wiley.
3. Raj Jain, *The Art of Computer Systems Performance Analysis*, Wiley India.

Text Books

1. C. R. Kothari, *Research Methodology: Methods and Techniques*, 2nd Edition, New Age International Publishers, New Delhi.
2. John W. Best and James V. Kahn, *Research in Education*, 10th Edition, Prentice Hall of India, New Delhi.
3. Douglas C. Montgomery, *Design and Analysis of Experiments*, 8th Edition, Wiley India.

e Resources

- NPTEL (SWAYAM) – Online courses on Research Methodology, Data Analysis, and Statistics <https://nptel.ac.in>
- Google Scholar – For research papers, literature review, and citation tracking <https://scholar.google.com>
- ResearchGate – Platform for accessing research publications and collaboration <https://www.researchgate.net>
- IEEE Xplore Digital Library – Technical research papers in engineering and technology <https://ieeexplore.ieee.org>
- Kaggle – Datasets and data analysis practice for research and experimentation <https://www.kaggle.com>

Useful websites / Video

- NPTEL YouTube Channel – Lectures on Research Methodology, Statistics, and Experimental Design <https://www.youtube.com/@nptelhrd>
- MIT OpenCourseWare – High-quality video lectures on research, data analysis, and modeling <https://ocw.mit.edu>

Strength of CO - PO/PSO Mapping (Sample): Attainment of a PO/PSO depends both on the attainment levels of associated COs of courses and the strengths to which it is mapped

- Each Course Outcome addresses a sub-set of POs and PSOs to varying levels (strengths: 1- Low, 2 – Medium, 3 - Strong).

Strength of CO-PO Mapping								
Strength of COs	PO							
	1	2	3	4	5	6	7	8
CO1	3	2	1	1	–	–	1	2
CO2	3	3	2	2	–	–	1	2
CO3	3	3	3	3	1	2	1	2
CO4	2	3	3	3	1	2	1	2
CO5	2	3	3	3	2	1	1	3



K.K.Wagh Institute of Engineering Education and Research, Nashik
FYMCA (Autonomous Syllabus 2026 Pattern)

Sr No	Components for Continuous Comprehensive Evaluation	Marks Allotted
1	Assignment 1	6
2	Quiz 1	6
3	Group Presentation	6
4	Assignment 2	6
5	Quiz 2	6
	Total	30



Course Code	2609506						
Course Name	Computer Lab (Web Technologies + Java)						
Type of Course	Major Core						
Teaching Scheme and Credits Weekly Working Hrs	TH(Hrs.)		TU(Hrs.)		PR(Hrs.)		Total Credits
	-		01		02		2
Assessment Scheme (Marks)	CCE	TW	PR	TU	ISE	ESE	Total (Marks)
	-	25	-	25	-	-	50

Prerequisites for the Course:

2. Basics of Programming Language

The course aims to:

Course Objectives	Description
1	To make students aware of web technologies and Java programming concepts used in software development.
2	To familiarize students with designing responsive and interactive web pages using HTML, CSS, and JavaScript.
3	To provide practical exposure to server-side scripting and database interaction in web applications.
4	To help students learn Java programming concepts including control structures, arrays, and object-oriented programming.
5	To get acquainted with problem-solving techniques and application development skills through web and Java-based programming tasks.

On completion of the course, learner will be able to–

Course Outcomes	Description	Bloom's Level
CO1	Implement responsive and interactive web pages using HTML5, CSS3, and responsive design principles.	L3 – Apply
CO2	Examine client-side scripting techniques using JavaScript, DOM manipulation, and event-driven programming to develop interactive web applications.	L4 – Analyze
CO3	Investigate server-side programming, database connectivity, JSON handling, and secure coding practices to develop dynamic web applications.	L4 – Analyze
CO4	Assess Java programming concepts, object-oriented programming principles, and exception handling for developing efficient software solutions.	L5 – Evaluate
CO5	Construct modern web and Java-based applications by integrating REST APIs, version control, and deployment concepts.	L6 – Create

Course context, Relevance, Practical Significance:



The Computer Lab (Web Technologies + Java) course provides hands-on experience in developing modern web and Java-based applications. It bridges programming fundamentals with industry-oriented software development by enabling students to apply HTML5, CSS3, JavaScript, PHP, MySQL, REST APIs, JSON, and Java programming concepts in practical applications. The course develops problem-solving, programming, database, object-oriented programming, secure coding, version-control, and deployment skills. Through practical assignments, self-learning activities, and an integrated SDG-based mini-project, students gain the competencies required for full-stack web development, backend development, API integration, Java application development, and application deployment. The course therefore strengthens both academic learning and employability-oriented technical skills.

Assignment List for Tutorial:

Sr. No.	Experiment	CO Mapped
1	Evaluate alternative Java solutions for a real-world utility billing problem, such as electricity or water consumption, where the bill is calculated according to different usage slabs. Analyze the input requirements, formulate the decision logic, and implement suitable conditional and iterative constructs to generate the final bill. Compare the suitability of different control structures for handling multiple conditions and repeated calculations.	CO4
2	Evaluate suitable Java approaches for managing and processing a collection of numerical records, such as examination marks or product prices. Implement appropriate array-based searching and sorting techniques, compare their working steps and results, and discuss the suitability of each technique for different data conditions.	CO4
3	Evaluate the design of a Java-based real-world application such as a Library or Inventory Management system using object-oriented programming concepts. Identify suitable classes, objects, attributes and methods, and examine how encapsulation and constructors can be used to organize the application. Incorporate appropriate exception-handling mechanisms for invalid or unexpected situations and evaluate how the design improves program robustness and maintainability.	CO4
4	Apply HTML5 and CSS3 concepts to design a structured information webpage for a college department, academic facility or campus service. Organize the content using suitable semantic HTML5 elements and apply CSS3 styling, layout, spacing, typography and responsive design principles to present the information effectively on different screen sizes.	CO1
5	Analyze the interaction flow of an online feedback or survey webpage developed using HTML, CSS and JavaScript. Identify suitable user events and DOM elements required to capture user actions, validate responses, dynamically modify webpage content and display appropriate feedback. Develop a suitable event-driven solution and analyze how DOM manipulation contributes to an interactive user interface.	CO2



6	Analyze and design a small web-service solution for a campus application using REST API principles. Define suitable resources, API endpoints, request and response structures, and JSON data formats for exchanging information between client and server. Prepare a basic Git-based version-control workflow and deployment plan for the proposed application, and analyze how these practices support systematic development and delivery of modern web applications.	CO3, CO5
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Assignment List for Practical:

Sr. No.	Practical Assignment	CO Mapped
1	Design and develop a responsive personal portfolio website using HTML5 semantic elements, CSS3, and responsive design principles.	CO1
2	Develop an interactive web application using JavaScript by implementing DOM manipulation, event handling, form validation, and dynamic content updates.	CO2
3	Develop a dynamic web application using PHP and MySQL with secure user authentication, session management, database connectivity, and JSON-based data handling.	CO3
4	Develop Java programs to solve computational problems using conditional statements, loops, functions, arrays, searching, and sorting techniques.	CO4
5	Develop a Java application using classes, objects, constructors, encapsulation, and exception handling to implement a real-world problem.	CO4
6	Develop and deploy a modern web application integrating HTML5, CSS3, JavaScript, PHP, MySQL, REST APIs, JSON, Git version control, and basic deployment concepts.	CO1, CO2, CO3, CO5

Strength of CO - PO/PSO Mapping (Sample): Attainment of a PO/PSO depends both on the attainment levels of associated COs of courses and the strengths to which it is mapped

- Each Course Outcome addresses a sub-set of POs and PSOs to varying levels (strengths: 1- Low, 2 – Medium, 3 - Strong).



Strength of CO-PO Mapping								
Strength of COs	PO							
	1	2	3	4	5	6	7	8
CO 1	3	2	2	1	2	–	–	1
CO 2	2	3	3	2	3	–	–	1
CO 3	2	3	3	2	3	1	–	1
CO 4	2	3	2	3	2	–	–	1
CO 5	2	3	3	3	3	1	1	2



Course Code	2609507						
Course Name	Python Programming						
Type of Course	Major Core						
Teaching Scheme and Credits	TH(Hrs.)	TU(Hrs.)		PR(Hrs.)		Total Credits	
Weekly Working Hrs	-	-		2		1	
Assessment Scheme	CCE	TW	PR	OR	ISE	ESE	Total (Marks)
(Marks)	-	25	-	-	-	-	25

Prerequisites for the Course:

1. Understanding of programming logic (algorithms, flowcharts, problem-solving approach)
2. Familiarity with any introductory programming language

The course aims to:

Course Objectives	Description
1	To develop problem-solving skills using core Python programming constructs and modular design.
2	To apply file handling, exception handling, and data processing techniques for real-world applications.
3	To analyze and visualize data using Python libraries for decision-making.
4	To design and develop web-based and data-driven applications with basic AI integration.

On completion of the course, learner will be able to–

Course Outcomes	Description	Bloom's Level
CO1	Apply core Python programming concepts (loops, conditionals, functions, OOP) to develop CLI-based applications such as expense trackers	3 – Apply
CO2	Apply file handling, exception handling, and data processing techniques to build systems like log analyzers and data cleaning pipelines	3 – Apply
CO3	Analyze and visualize data using Python libraries (Pandas, Matplotlib, Seaborn) to generate meaningful insights	4 – Analyze
CO4	Design and develop web-based applications and integrate basic AI features using frameworks like Flask	6- Create

Course context, Relevance, Practical Significance:

This course focuses on developing problem-solving and application development skills using Python through real-world projects such as data analysis, visualization, and web applications. It is highly relevant to industry needs in areas like data science, automation, and AI. The course emphasizes hands-on learning using tools like Pandas, Matplotlib, and Flask to build practical, job-ready skills.

Course Contents:

Unit	Contents	Cos Mapped
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1	Develop a CLI-based Expense Tracker using Python (loops, conditionals, functions) to record, update, and analyse daily expenses. Suggested AI Tools: ChatGPT, GitHub Copilot, Claude	CO1
2	Build a Log Analyser System that reads server/application log files, extracts useful information, and handles errors using exception handling. Suggested AI Tools: ChatGPT, Claude, GitHub Copilot	CO2
3	Perform Data Cleaning & Transformation using Pandas on a real-world dataset (missing values, duplicates, formatting, aggregation). Suggested AI Tools: ChatGPT (Data Analysis mode), Claude, Microsoft Copilot	CO2
4	Create an Interactive Data Visualization Dashboard (Matplotlib/Seaborn) to analyze trends (sales, student performance, etc.) Suggested AI Tools: ChatGPT, GitHub Copilot, Julius AI, Claude	CO3
5	Develop a Web Scraper + Data Storage System using BeautifulSoup/Scrapy to collect data (e.g., product prices/jobs) and store it in CSV/DB Suggested AI Tools: ChatGPT, GitHub Copilot, Perplexity AI	CO4
6	Build a Flask-based Smart Task Manager with CRUD operations and integrate a basic AI feature (e.g., task suggestions using APIs or logic) Suggested AI Tools: ChatGPT, GitHub Copilot, Claude	CO4

References Books

1. Kenneth A. Lambert, "The Fundamentals of Python: First Programs", Cengage Learning, 1st Edition, 2011.
2. Allen Downey, "Think Python: How to Think Like a Computer Scientist", O'Reilly, 2nd Edition, 2015.
3. Reema Thareja, "Python Programming using Problem Solving Approach", Oxford University Press, 1st Edition, 2017.
4. Tony Gaddis, "Starting out with Python", Pearson, 3rd Edition, 2014

Text Books

1. Budd T A, "Exploring Python", McGraw-Hill Education, 1st Edition, 2011.
2. Mark Lutz, "Learning Python", O'Reilly, 4th Edition, 2013.
3. Y. Daniel Liang, "Introduction to Programming Using Python", Pearson, 1st Edition, 2013

e Resources

1. <https://www.programiz.com/python-programming/online-compiler/>
2. <https://replit.com/>

Useful websites / Video

https://www.youtube.com/watch?v=JeznW_7DIB0
<https://www.youtube.com/watch?v=ZDa-Z5JzLYM>
<https://www.youtube.com/watch?v=vmEHCJofslg>
<https://www.youtube.com/watch?v=dpOaMZ8J7kM>
<https://www.youtube.com/watch?v=GPVsHOIRBBI>
<https://www.youtube.com/watch?v=Eaz5e6M8tL4>
<https://www.youtube.com/watch?v=daefaLgNkw0>



<https://www.youtube.com/watch?v=UO98IJQ3QGI>
<https://www.youtube.com/watch?v=6GUZXDef2U0>
<https://www.youtube.com/watch?v=0P7QnIQDBJY>
<https://www.youtube.com/watch?v=ALizgnSFTwQ>
https://www.youtube.com/watch?v=ve_0h4j3h2k
https://www.youtube.com/watch?v=SmhMpe_6C34
<https://www.youtube.com/watch?v=3Xc3CA655Y4>
https://www.youtube.com/watch?v=Z1RJmh_OqeA
<https://www.youtube.com/watch?v=dam0GPOAvVI>
<https://www.youtube.com/watch?v=K8YELRmUb5o>

Strength of CO - PO/PSO Mapping (Sample): Attainment of a PO/PSO depends both on the attainment levels of associated COs of courses and the strengths to which it is mapped

- Each Course Outcome addresses a sub-set of POs and PSOs to varying levels (strengths: 1- Low, 2 – Medium, 3 - Strong).

Strength of CO-PO Mapping								
Strength of COs	PO							
	1	2	3	4	5	6	7	8
CO 1	3	2	2	1	1	–	–	1
CO 2	3	3	2	2	1	–	1	1
CO 3	2	3	2	3	1	–	–	2
CO 4	2	2	3	3	2	1	1	2
CO 5	3	2	2	1	1	–	–	1



Course Code	2609508						
Course Name	Digital Communication and Presentation Lab						
Type of Course	Ability Enhancement Course						
Teaching Scheme and Credits	TH(Hrs.)	TU(Hrs.)		PR(Hrs.)		Total Credits	
Weekly Working Hrs	-	-		2		1	
Assessment Scheme (Marks)	CCE	TW	PR	OR	ISE	ESE	Total (Marks)
	25	-	-	-	-	-	25

Prerequisites for the Course: Nil

The course aims to:

Course Objectives	Description
1	Develop effective verbal, non-verbal, interpersonal and digital communication skills required in academic and professional environments.
2	Develop students' ability to create and deliver effective technical and professional presentations using appropriate digital tools.
3	Develop professional communication and employability skills through digital collaboration, AI-assisted communication, group activities and workplace-oriented tasks.

On completion of the course, learner will be able to–

Course Outcomes	Description	Bloom's Level
CO1	Apply appropriate verbal, non-verbal and digital communication techniques in academic and professional situations.	3- Apply
CO2	Design and deliver effective technical and professional presentations using digital and AI-assisted tools.	3- Apply
CO3	Demonstrate professional communication, collaboration and employability skills through emails, group discussions, meetings, resumes and interviews.	3- Apply

Course context, Relevance, Practical Significance:

This course develops essential digital communication, presentation and professional skills required by MCA students in academic and industry environments. Through hands-on activities such as professional communication, technical presentations, group discussions, meetings, resume preparation and mock interviews, students enhance their confidence, collaboration and employability. The course also integrates digital and AI-assisted tools to promote effective, responsible and industry-relevant communication.

Course Contents:

Assignment No	Assignment Title	CO Mapped
1	Digital Communication and Netiquette Topics: Digital communication, Formal and informal communication, Professional digital etiquette, Netiquette Communication barriers, Appropriate use of email,	CO1, CO3



	messaging and online meeting platforms, Activity: Analyse different digital communication scenarios and identify appropriate and inappropriate communication practices.	
2	Professional Self-Introduction and Elevator Pitch Activity: Prepare and deliver a 60–90 second professional self-introduction covering: Educational background, Technical skills, Strengths, Projects/interests, Career goals Students will also prepare a short elevator pitch. AI Integration: Use an AI tool to improve the structure and language of the introduction and critically evaluate the suggested changes.	CO1, CO3
3	Professional Email and Digital Message Writing Activity: Prepare professional emails/messages for the following situations: Requesting project guidance, Internship enquiry, Meeting invitation, Project status update, Leave/request, Reporting a technical issue, Students will also convert informal messages into professional messages. AI Integration: Use AI tools for grammar, clarity and tone improvement and compare the original and revised versions.	CO1, CO3
4	Active Listening and Non-Verbal Communication Activities: • Listening and summarization • Question-and-answer activity • Role play • Body language analysis • Eye contact and posture • Voice modulation Students record a short communication activity and perform self-assessment.	CO1, CO3
5	Technical Presentation Design Activity: Create a 5–7 slide technical presentation on an emerging technology such as: Generative AI, Cloud Computing, Cyber Security, Machine Learning, IoT, Blockchain, Sustainable Computing, Focus on: Content organization, Slide design, Visual elements, Charts/diagrams, Technical accuracy, AI Integration: Use AI tools for brainstorming, outline preparation, content summarization and speaker-note generation. Verify all AI-generated information.	CO2, CO3
6	Technical Presentation and Q&A Activity: Deliver the presentation prepared in Assignment 5 for 5 minutes, followed by a Q&A session. Assessment parameters: • Technical content	CO1, CO2, CO3



	• Organization • Communication • Confidence • Voice modulation • Body language • Slide design • Time management • Question handling	
7	Group Discussion and Collaborative Communication Activity: Conduct group discussions on current technology and professional issues. Suggested topics: Will AI replace software developers?, AI in education, Cybersecurity vs. privacy, Remote work vs. office work, Open-source vs. proprietary software, Social media and digital well-being	CO1, CO3
8	Professional Meeting Simulation Activity: Conduct a simulated IT project meeting involving roles such as: Project Manager, Developer, Tester, Business Analyst, Client Students will practise: Agenda preparation, Opening a meeting, Presenting issues, Discussion, Decision making, Conflict resolution, Assigning responsibilities, Closing the meeting, Preparing Minutes of Meeting	CO1, CO3
9	Resume, LinkedIn Profile and AI-Assisted Career Communication Activity: Prepare One-page professional resume, Professional LinkedIn profile, Short professional profile/summary Include: Technical skills, Projects, Certifications, Achievements, Career interests, AI Integration: Students may use AI tools to: Improve resume language, Analyse job descriptions, Identify relevant keywords, Improve professional summaries, Identify skill gaps Students must not use AI to fabricate qualifications, skills or achievements.	CO1, CO3
10	Mock Interview and Digital Portfolio Part A – Mock Interview Conduct an individual mock interview covering: Self-introduction, Academic background, Technical skills, Project discussion, Strengths and weaknesses, Career goals, Situational questions AI may be used for interview-question generation and practice. Part B – Digital Portfolio Students compile a professional digital portfolio containing: Professional introduction, Resume, Technical skills,	CO1, CO2, CO3



	Projects, Certifications, Technical presentation, Professional profile, Portfolio/GitHub link		
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References Books

1. Raman, Meenakshi & Sharma, Sangeeta, “Technical Communication: Principles and Practice”, Oxford University Press.
2. Lesikar, Raymond V., Flatley, Marie E. & Rentz, Kathryn, “Business Communication: Making Connections in a Digital World”, McGraw-Hill.
3. Rizvi, M. Ashraf, “Effective Technical Communication”, McGraw-Hill Education.
4. Bovee, Courtland L. & Thill, John V., “Business Communication Today”, Pearson.
5. Locker, Kitty O. & Kaczmarek, Stephen K., “Business Communication: Building Critical Skills”, McGraw-Hill.

Online Resources

- Microsoft Learn – Communication and Microsoft 365 resources
- Google Workspace Learning Center
- Canva Design School
- LinkedIn Learning resources
- TED Talks for presentation and public speaking practice
- Purdue Online Writing Lab (OWL)

Strength of CO - PO/PSO Mapping (Sample): Attainment of a PO/PSO depends both on the attainment levels of associated COs of courses and the strengths to which it is mapped

- Each Course Outcome addresses a sub-set of POs and PSOs to varying levels (strengths: 1- Low, 2 – Medium, 3 - Strong).

Strength of CO-PO Mapping								
Strength of COs	PO							
	1	2	3	4	5	6	7	8
CO 1	1	2	2	2	3	–	2	2
CO 2	1	2	2	3	2	1	2	2
CO 3	1	2	2	2	3	2	3	3



Course Code	2609509						
Course Name	MOOC - I on Human Rights						
Type of Course	Humanities, Social Science and Management						
Teaching Scheme and Credits	TH(Hrs.)	TU(Hrs.)		PR(Hrs.)		Total Credits	
Weekly Working Hrs	1	-		-		1	
Assessment Scheme	CCE	TW	PR	OR	ISE	ESE	Total (Marks)
(Marks)	25	-	-	-	-	-	25

Prerequisites for the Course:

1. Basic understanding of social and workplace environments

The course aims to:

Course Objectives	Description
1	To encourage self-directed learning through Massive Open Online Courses (MOOCs) offered by recognized online learning platforms.
2	To enable students to acquire domain-specific knowledge and emerging skills beyond the regular curriculum.
3	To develop lifelong learning, critical thinking, and problem-solving abilities through structured online learning.
4	To promote digital learning competency and continuous professional development by successfully completing a relevant MOOC course.

On completion of the course, learner will be able to–

Course Outcomes	Description	Bloom's Level
CO1	Explain the concepts and knowledge acquired through the selected MOOC course.	2-Understand
CO2	Apply the knowledge and skills gained from the MOOC course to solve academic or real-world problems.	3-Apply
CO3	Analyze and evaluate concepts, methodologies, or case studies covered in the selected MOOC course.	4-Analyze
CO4	Demonstrate self-learning capability, digital learning skills, and professional development through successful completion of a MOOC course.	3-Apply

Course context, Relevance, Practical Significance:

Human Rights education is essential for developing responsible and socially conscious citizens who value equality, dignity, freedom, and justice. This course introduces students to the fundamental concepts and evolution of human rights, the International Human Rights System, human rights in open societies, and the relationship between climate change and human rights. It enables students to understand global human rights principles, contemporary challenges, and the importance of protecting and promoting human rights for sustainable and inclusive societies.

As part of the syllabus, students are encouraged to complete MOOC courses related to Human



Rights through recognized online learning platforms such as SWAYAM, NPTEL, Coursera, edX, and Udemy. These platforms provide structured courses delivered by subject experts, offering practical knowledge and real-world perspectives on human rights and social justice.

MOOCs (Massive Open Online Courses)

This course aims to create an excellent opportunity for students to acquire the necessary skill set for employability through massive online courses where the rare expertise of world-famous experts from academics and industry are available. MOOCs (Massive Open Online Courses) provide affordable and flexible ways to learn new skills. MOOCs are courses delivered online and accessible to all for free.

- Massive because enrollments are unlimited and can run into thousands of learners.
- Open because anyone can enroll — there is no admission process.
- Online because they are delivered via the internet.
- Course because their goal is to teach a specific subject.

MOOCs typically comprise video lessons, reading materials, assignments, quizzes, and discussion forums.

SWAYAM is a programme initiated by Government of India and designed to achieve the three cardinal principles of Education Policy viz., access, equity and quality. The objective of this effort is to take the best teaching learning resources to all, including the most disadvantaged. SWAYAM seeks to bridge the digital divide for students who have hitherto remained untouched by the digital revolution and have not been able to join the mainstream of the knowledge economy.

NPTEL - National Programme on Technology Enhanced Learning is a project of MHRD initiated by seven Indian Institutes of Technology (Bombay, Delhi, Kanpur, Kharagpur, Madras, Guwahati and Roorkee) along with the Indian Institute of Science, Bangalore in 2003, to provide quality education to anyone interested in learning from the IITs. The main goal was to create web and video courses in all major branches of engineering and physical sciences at the undergraduate and postgraduate levels and management courses at the postgraduate level.

MOOC course providers like SWAYAM, NPTEL, edX, Coursera, Udemy, Udacity or similar platforms help students in acquiring knowledge and career advancement.

Course Contents:

The Department of Master of Computer Applications (MCA) recommends the following MOOC course as part of the curriculum to promote self-learning and enhance students' knowledge in Human Rights. Students are encouraged to enroll in and successfully complete this course through the SWAYAM platform. However, students who are interested in exploring related topics may choose another relevant MOOC course offered through recognized online learning platforms such as SWAYAM, NPTEL, Coursera, edX, Udemy, or other equivalent platforms, provided that the selected course aligns with the course objectives and learning outcomes.

Course Name: International Human Rights System



Course Instructor: Dr.Y.S.R. Murthy, Vice Chancellor, RV University		
Platform: Swayam	Duration: 3 Weeks	Mode: Online
Start Date: 6 Jul 2026	Enrolment Ends: 31 Aug 2026	End Date: 31 Oct 2026
Week 1	Module 1: Meaning, Significance and Historical Development of Human Rights Module 2: Natural Rights Module 3: Liberal, Libertarian and Legal Positivist Theories of Rights Quiz Assessment 1	
Week 2	Module 1: Communitarian and Feminist Theory of Rights Module 2: Marxist Theory of Rights Quiz Assessment 2	
Week 3	Module 1: Human Rights Provisions in the UN Charter Module 2: UN General Assembly – Mandate regarding Protection and Promotion of Human Rights Module 3: United Nations Security Council and Protection of Human Rights Quiz Assessment 3	
Week 4	Module 1: Economic and Social Council Module 2: United Nations Commission on Human Rights Module 3: United Nations Commission on the Status of Women Quiz Assessment 4	
Week 5	Module 1: United Nations Commission for Social Development Module 2: Commission on Crime Prevention and Criminal Justice Module 3: International Court of Justice Quiz Assessment 5	
Week 6	Module 1: Human Rights Council: Birth of the Human Rights Council; Comparison between the Human Rights Commission and the Human Rights Council Module 2: Human Rights Council: UN Secretary-General's Report – In Larger Freedom: Towards Development, Security and Human Rights for All Quiz Assessment 6	
Assessment Guidelines: Students are required to successfully complete the weekly quiz assessments as part of the selected MOOC course. The department will conduct a test based on the course content to evaluate the knowledge gained through the MOOC. The final marks for the course will be assigned based on the student's performance in the weekly quiz assessments and the department-conducted test.		
e Resources • https://swayam.gov.in • https://onlinecourses.nptel.ac.in • https://coursera.org • https://edx.org		



Course Code	2609511						
Course Name	Artificial Intelligence						
Type of Course	Major Core						
Teaching Scheme and Credits	TH(Hrs.)	TU(Hrs.)		PR(Hrs.)		Total Credits	
Weekly Working Hrs	3	-		-		3	
Assessment Scheme	CCE	TW	PR	OR	ISE	ESE	Total (Marks)
(Marks)	30	-	-	-	20	50	100

Prerequisites for the Course:

1. Discrete Mathematics
2. Data Structure and Algorithms

The course aims to:

Course Objectives	Description
1	To understand the fundamental concepts of Artificial Intelligence,
2	To analyze and apply various search techniques and problem-solving strategies
3	To develop knowledge representation models and reasoning mechanisms
4	To explore planning and machine learning approaches
5	To understand and evaluate emerging AI technologies

On completion of the course, learner will be able to–

Course Outcomes	Description	Bloom's Level
CO1	Apply the concepts of artificial intelligence, intelligent agents, and problem-solving approaches to analyze AI-based systems and real-world applications.	3- Apply
CO2	Apply informed and uninformed search techniques, heuristic methods, and constraint satisfaction approaches to solve AI search and optimization problems.	3- Apply
CO3	Analyze knowledge representation techniques and logical inference methods to model and solve real-world problems.	4- Analyze
CO4	Analyze planning strategies and learning methods, including neural networks, to determine suitable approaches for different problem domains.	4- Analyze
CO5	Evaluate AI solutions based on expert systems, natural language processing, and generative AI technologies for developing intelligent applications using appropriate AI tools.	5 – Evaluate

Course context, Relevance, Practical Significance: Artificial Intelligence is a core discipline that enables machines to simulate human intelligence through learning, reasoning, and decision-making. This course provides foundational knowledge of AI concepts, search techniques, knowledge representation, planning, and machine learning methods. It equips students with the skills required to design intelligent systems used in various domains. With the rapid growth of technologies like neural networks and generative AI, this course is highly



relevant for building industry-ready competencies. It also prepares students for advanced research and real-world problem-solving in intelligent systems.

Course Contents:

Unit	Contents	Lecture Hours	Cos Mapped
1	Fundamentals of Artificial Intelligence: Introduction to AI and Intelligent Systems, Foundations and History of AI, AI Applications, AI representation, Intelligent agent - Environment, characteristics, behavior, concept of Rationality, structure of agents, Problem-solving approach in AI.	7	CO1
2	Search Techniques & Problem Solving: Solving Problems by Searching, Uninformed Search Strategies: Breadth-first search, Uniform-cost search, Depth-first search, Depth limited search, Iterative deepening depth-first search, Bidirectional search, Informed (Heuristic) Search Strategies: Greedy best first search A* search: Minimizing the total estimated solution cost, Conditions for optimality: Admissibility and consistency, Optimality of A*, Heuristic Functions, Hill climbing, Constraint satisfaction problem. Case Study: Route Optimization (Google Maps shortest path problem) Suggested AI tool: GitHub Copilot	7	CO2
3	Knowledge Representation Knowledge based Agents, First-Order Logic and Its Inference, Classical Planning, Planning and Acting in the Real World, Definition of knowledge, properties for knowledge representation system, predicate calculus-connectives, variables and quantification, Predicates and arguments, ISA hierarchy, Introduction to non-monotonic logic, TMS(truth maintenance system), Statistical and probabilistic reasoning. Case Study: Route Optimization (Google Maps shortest path problem) Suggested AI tool: Microsoft Copilot	7	CO3
4	Planning and Learning Methods Planning: Introduction: Search in planning, search vs planning, planning as problem solving, components of a planning, Forward planning, Nonlinear planning using constraint posting, Hierarchical planning Learning: Introduction, Learning methods, Introduction to Neural Networks, Working of a Neuron, The basic components of ANN, Issues related to Neural computation, Feedforward Networks, Back propagation Algorithm, Applications of Neural Networks Case Study: Handwritten Digit Recognition using Neural Networks Suggested AI Tool : Hugging Face Spaces	7	CO4



5	Emerging AI Technologies & Applications Expert Systems: Expert system concept, Utilization and functionality of Expert system, Architecture of Expert system, Components of Expert system. Natural Language Processing: Language Models, Steps in NLP, Syntactic Analysis (Parsing), Semantic interpretation, Discourse and pragmatic Processing, Text Classification, Implementation aspects of Syntactic Analysis (Parsing) Generative AI: Concept of Generative AI, Types, Foundation Models & Large Language Models (LLMs), Prompt engineering basics, Applications Case Study: AI Chatbot (Customer Support / ChatGPT-like system) Suggested AI Tool : ChatGPT, Gemini	8	CO5																																																																												
	References Books 1. Deepak Khemani, “A First Course in Artificial Intelligence”, McGraw Hill Education(India), 2013, ISBN :978-1-25-902998-1 2. Saroj Kausik, “Artificial Intelligence”, ISBN:- 978-81-315-1099-5, Cengage Learning. 3. Padhy, “Artificial Intelligence and Intelligent Systems”, Oxford University Press. 4. Patrick Henry Winston, “Artificial Intelligence”, Addison-Wesley Publishing Company, ISBN: 0 201-53377-4																																																																														
Text Books 1. Peter and Norvig, “Artificial Intelligence: A Modern Approach”, ISBN-0-13- 103805. 2. Elaine Rich, Kevin Knight and Nair, “Artificial Intelligence”, ISBN-978-0-07- 008770-5, TMH.																																																																															
e Resources • https://www.youtube.com/watch?v=pKeVMlkFpRc&list=PLwdnzlV3ogoXaceHrrFVZCJ Kbm IaSHcH • https://www.coursera.org/learn/ai-for-everyone																																																																															
Useful websites / Video • https://skillsbuild.org/students/course-catalog/artificial-intelligence																																																																															
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Guidelines for Continuous Comprehensive Evaluation of Theory Course

Sr. No.	Components for Continuous Comprehensive Evaluation	Marks Allotted
1	Group Presentation	6
2	Quiz - 1	6
3	Assignments - 1	6
4	Quiz - 2	6
5	Assignments - 2	6
	Total	30



Course Code	2609512						
Course Name	Database Systems and NoSQL						
Type of Course	Major Core						
Teaching Scheme and Credits	TH(Hrs.)	TU(Hrs.)		PR(Hrs.)		Total Credits	
Weekly Working Hrs	3	-		4		5	
Assessment Scheme	CCE	TW	PR	OR	ISE	ESE	Total (Marks)
(Marks)	30	25	50	-	20	50	175

Prerequisites for the Course: Data Structures and Algorithms

The course aims to:

Course Objectives	Description
1	To introduce fundamental concepts of database systems and ER/EER modelling
2	To develop the ability to create, manipulate, and retrieve data using SQL, and PL/SQL constructs.
3	To understand relational database design principles
4	To explain transaction management concepts
5	To familiarize students with modern database technologies

On completion of the course, learner will be able to–

Course Outcomes	Description	Bloom's Level
CO1	Apply database concepts to develop data models, design ER/EER diagrams, and construct relational schemas based on given data requirements.	3-Apply
CO2	Apply SQL queries and PL/SQL constructs to create and manipulate relational databases.	3-Apply
CO3	Apply database design principles to develop normalized relational schemas, implement integrity constraints,	3-Apply
CO4	Analyze transaction processing, concurrency control protocols, recovery mechanisms, serializability, and scheduling techniques to ensure database consistency and reliability.	4 – Analyze
CO5	Design and develop database solutions by selecting and implementing appropriate relational or NoSQL database technologies for real-world applications.	6 – Create

Course context, Relevance, Practical Significance:

The Database System and SQL course equips MCA students with a comprehensive understanding of modern database technologies, covering the design, implementation, management, and optimization of relational and NoSQL databases. It introduces fundamental concepts such as data modeling, ER and relational models, SQL programming, PL/SQL, normalization, query processing, transaction management, concurrency control, recovery techniques, and distributed database systems, while also addressing emerging data paradigms through MongoDB and NoSQL databases. The practical component emphasizes hands-on experience in designing database schemas, writing SQL and PL/SQL programs, implementing



constraints, triggers, cursors, views, indexes, and performing CRUD and aggregation operations in MongoDB. These practical skills enable students to develop efficient, secure, and scalable database applications, strengthen problem-solving abilities, and prepare them for real-world software development, database administration, data engineering, and enterprise application development in industry.

Course Contents:

Unit	Contents	Lecture Hours	Cos Mapped
1	Introduction: Database Concepts, View of Data, Database System Structure, Database Architectures: Centralized and Client-Server Architectures, 2 Tier and 3 Tier Architecture, Data Models, Database Design, ER Model: Entity, Attributes, Relationships, Constraints, Keys, ER Diagram, Extended E-R Features, converting E-R & EER diagram into tables, Relational Model: Database Schema, Keys Suggested AI tool for ER Diagram: Lucidchart AI	6	CO1, CO5
2	SQL: Characteristics and advantages, SQL Data Types and Literals, DDL, DML, SQL Operators, Tables: Creating, Modifying, Deleting, Indexes, SQL DML Queries: SELECT Query and clauses, Database Modification using SQL Insert, Update and Delete Queries, Set Operations, Predicates and Joins, Set membership, Set comparison, Ordering of Tuples, Aggregate Functions, Nested Queries, Views: Creating, Dropping, Updating using Views, PL/SQL: concept of Stored Procedures & Functions, Cursors, Triggers, Assertions, roles and privileges Suggested AI tool for Query generation and optimization: Chat2DB, Oracle AI	9	CO2, CO5
3	Relational Integrity: Domain, Referential Integrities, Enterprise Constraints Database Design: Features of Good Relational Designs, Normalization, Functional Dependencies, Inference Rules, Atomic Domains and First Normal Form, Decomposition using Functional Dependencies, Algorithms for Decomposition, 2NF, 3NF, BCNF, 4 NF Query Processing: Query Processing, Query Optimization Suggested AI tool : Claude AI	7	CO3, CO5
4	Transaction concepts, ACID properties, Concept of Schedule, Conflict Serializability, View serializability, Cascadeless Schedules, Recoverable and Non recoverable Schedules, Concurrency Control: Lock-Based Protocols, Deadlock Handling, Timestamp-Based Protocols, Recovery methods: Shadow-Paging and Log-Based Recovery, Checkpoints	7	CO4
5	Introduction to Parallel Databases and Distributed Database System, types, advantages, disadvantages. Types of Data: Structured, Unstructured Data and Semi-Structured Data.	7	CO5



	NoSQL Database: Introduction, Need, Features. Types of NoSQL Databases: Key-value store, document store, graph, wide column stores, CAP Theorem, BASE Properties, Comparative study of RDBMS and NoSQL. MongoDB: CRUD Operations, Indexing, Aggregation, Replication, Sharding Suggested AI tool :GitHub Copilot		
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References Books

1. Ramkrishna R., Gehrke J. "Database Management Systems", 3rd edition, McGraw Hill.
2. Feuerstein, Steven & Pribyl, Bill. "Oracle PL/SQL Programming", 6th Edition. O'Reilly Media, 2014. ISBN-10: 1449324452; ISBN-13: 9781449324452
3. Kristina Chodorow, Michael Dierolf, "MongoDB: The Definitive Guide", O'Reilly Publications, ISBN: 978-1-449-34468-9
4. Adam Fowler, "NoSQL For Dummies", John Wiley & Sons, ISBN-111890562

Text Books

1. Silberschatz A., Korth H., Sudarshan S., "Database System Concepts", 7th edition. McGraw Hill Publishers, ISBN10: 9390727502, ISBN13: 9789390727506.
2. Connally T, Begg C., "Database Systems", Pearson Education, ISBN 81-7808-861-4
3. Pramod J. Sadalage and Martin Fowler, "NoSQL Distilled", Addison Wesley, ISBN10: 0321826620, ISBN-13: 978-0321826626

e Resources

- [SQL and Relational Theory \(How to Write Accurate SQL code\), C.J. Date, O'REILLY Publication](#)

Useful websites / Video

- <https://www.youtube.com/watch?v=sEaYXwmsLw0&list=PLyqSpQzTE6M-xymXggewlzcC3U4cdRoSu>
- https://sqlzoo.net/wiki/SQL_Tutorial

Strength of CO - PO/PSO Mapping (Sample): Attainment of a PO/PSO depends both on the attainment levels of associated COs of courses and the strengths to which it is mapped

- Each Course Outcome addresses a sub-set of POs and PSOs to varying levels (strengths: 1- Low, 2 – Medium, 3 - Strong).

Strength of COs	Strength of CO-PO Mapping							
	PO							
	1	2	3	4	5	6	7	8
CO1	3	2	3	2	-	-	-	1
CO2	3	2	3	3	-	-	-	1
CO3	3	3	3	2	-	-	1	1
CO4	2	3	2	2	-	1	2	1
CO5	2	2	3	3	2	2	1	3



Guidelines for Continuous Comprehensive Evaluation of Theory Course

Sr. No.	Components for Continuous Comprehensive Evaluation	Marks Allotted
1	Assignments - 1	6
2	Quiz - 1	6
3	Open Book Test	6
4	Quiz - 2	6
5	Assignments - 2	6
	Total	30

List of Laboratory Experiments / Assignments

Sr. No.	Laboratory Experiments / Assignments	CO Mapped
1	Implement SQLDDL statements which demonstrate the use of SQL objects such as Table, View, Index, Sequence, different constraints etc with suitable example	CO2,CO5
2	Write at least 10 SQL queries on the suitable database application using SQL DML statements: Insert, Select, Update, Delete with Operators (Arithmetic Operators, Logical Operators, Comparison Operator, Special Operator), functions (Number function, Aggregate Function, Character Function, Conversion Function, Date Function)	CO2,CO5
3	Implement Group By, Having clause and Order by clause with suitable example.	CO2,CO5
4	Design at least 10 SQL queries for suitable database application using SQL DML statements: all types of Joins, Sub-Query and View.	CO2,CO5
5	Write a PL/SQL block for following requirement and handle the exceptions. Roll no. of student will be entered by user. Attendance of roll no. entered by user will be checked in Student table. If attendance is less than 75% then display the message "Term not granted" and set the status in Student table as "D". Otherwise display message "Term granted" and set the status in Student table as "ND"	CO2,CO5
6	Study & Implementation of SQL Cursors. Consider following Employee schema. Employee (ID, Name, Age, Address, Salary) i) Write a PL/SQL block to increase salary of those employees having minimum salary by 5000. Display count of employees who got hike in salary. (Implicit Cursor) ii) Display employee name, address, salary along with age category (young or old) (Use an explicit cursor) iii) Display count of young and old employees (Use an explicit cursor)	CO2,CO5
7	Write a PL/SQL function to calculate gross salary on basis of basic salary. If DA is 40% of basic, HRA is 20% of basic and PF deduction is 12% of basic salary. Gross salary=Basic Salary+DA+HRA-PF	CO2,CO5



	Accept basic salary from user and pass it to function, function will return gross salary.	
8	Create a transparent audit system for a table Employees using trigger. The system must keep track of the records that are being deleted or updated. When a record is deleted or modified in a employee table, employee id and the date of operation are stored in the audit table, then the delete or update operation is allowed to go through.	CO2,CO5
9	Study of Open Source NOSQL Database: MongoDB, Installation of MongoDB Create database in MongoDB, Create a collection named student, Insert 5 records with field (Student_ number, Name, Address, contact_number , subjects and percentage). 1) Insert 1 more document in collection with additional field of hobbies. 2) Display information of all students 3) Display details of students who have secured more than 70 percentage 4) Update percentage of student whose student _ number is 5 5) Delete document of 'Rohan' from database 6) Demonstrate use of Save () Method	CO5
10	Create a database in MongoDB. Create a collection named orders with fields(order_id, customer_name, city, product, category, quantity, price, order_date). 1. Insert minimum 5 records 2. Display details of orders where total amount (quantity × price) is greater than ₹50,000 using aggregation. 3. Find total sales for each category using aggregation framework. 4. Display average order value for each city. 5. Find top 2 products based on total quantity sold. 6. Create an index on product field and display all indexes of the collection. 7. Create a compound index on city and category. 8. Demonstrate the use of aggregation pipeline stages (\$match, \$group, \$project, \$sort) in at least one query.	CO5

Guidelines for Laboratory Conduction

1. Use of open-source software is encouraged.
2. Instructor should identify and set one assignment beyond the scope of syllabus.
3. Operating System recommended: - Windows / Open source Linux or its derivative

Guidelines for Student's Lab Journal

1. The laboratory assignments are to be submitted by student in the form of journal.
2. Journal consists of certificate, table of contents, and handwritten write-up of each assignment (Title, Objectives, Problem Statement, Outcomes, Date of Completion, assessor's sign, Theory Concept in brief, algorithm, flowchart, conclusion.).
3. Program codes with sample output of all performed assignments are to be submitted as softcopy.
4. Course in-charge is highly encouraged to maintain soft copy of all the students' assignments

Guidelines for Term work Assessment



Continuous assessment of laboratory work is done based on overall performance of student. Each lab assignment assessment will assign marks based on rubrics. Suggested rubrics for overall assessment include-

Sr. No.	Components for Continuous Assessment	Marks Allotted
1	R1: Timely Submission	10
2	R2: Understanding	10
3	R3: Clarity of Journal Writing	10
Total Marks:		30
Each assignment will get 30 marks. Average of all assignments is converted into total TW marks		



Course Code	2609513						
Course Name	Cyber Security						
Type of Course	Major Core						
Teaching Scheme and Credits Weekly Working Hrs.	TH(Hrs.)	TU(Hrs.)		PR(Hrs.)		Total Credits	
	3	-		2		4	
Assessment Scheme (Marks)	CCE	TW	PR	OR	ISE	ESE	Total (Marks)
	30	25	-	-	20	50	125

Prerequisites for the Course:

1. Mathematical Foundation for Computer Application,
2. Data Structures and Algorithms

The course aims to:

Course Objectives	Description
1	To understand modern cyber threats and security principles.
2	To study advanced cryptographic techniques and secure systems.
3	To explore cloud, AI, and emerging Cyber security technologies.
4	To Analyse cyber laws, governance, and risk management frameworks.

On completion of the course, learner will be able to –

Course Outcomes	Description	Bloom's Level
CO1	Explain modern information security principles and Zero Trust architecture	3 - Apply
CO2	Analyse cyber threats, malware, and advanced attack Techniques	4 - Analyze
CO3	Apply cryptographic techniques and secure communication methods	3 - Apply
CO4	Evaluate security governance, risk management, and cyber laws	5 - Evaluate
CO5	Implement security solutions in cloud, AI, and enterprise environments.	3 - Apply

Course context, Relevance, Practical Significance:

Cyber Security has become a fundamental requirement in today's digital world where data, networks, and systems are continuously exposed to various cyber threats. This course provides a comprehensive understanding of security principles, cryptographic techniques, network security, and modern protection mechanisms. It introduces students to both theoretical and practical aspects of securing information systems, aligning with current industry standards and emerging technologies. With the rapid growth of digital transformation, cloud computing, and online services, cyber threats such as data breaches, ransom ware, and phishing attacks are increasing significantly. This course is highly relevant as it equips students with essential knowledge of identifying vulnerabilities, understanding cyber laws, and implementing security measures. It also aligns with industry requirements in areas such as ethical hacking, cloud security, and data protection, making students industry-ready. The course emphasizes hands-on learning through practical assignments such as encryption techniques, packet analysis, and security configuration.



Students gain real-world exposure to tools and techniques used in cyber security, enabling them to analyse threats and implement preventive measures. The knowledge acquired in this course helps students secure personal and organizational data, enhances employability in cyber security roles, and supports lifelong learning in a rapidly evolving technological environment.

Course Contents:

Unit	Contents	Lecture Hours	Cos Mapped
1	Modern Security Fundamentals & Zero Trust An Overview of Information Security: The Basic Components, Elements of Information Security, Policy and Mechanism: Confidentiality, Integrity, and Availability (CIA Triad) Introduction to Cyber Space, Cyber Laws, Cyber Security and Information Systems Zero Trust Architecture (ZTA) Types of Cyber Threats (APT, Insider Threats) Introduction to Ethical Hacking & Penetration Testing. Suggested AI Tools: ChatGPT, Google Gemini, Microsoft Copilot	07	CO1
2	Cryptography & Data Protection (Modern Approach) Symmetric & Asymmetric Encryption AES, RSA, Substitution and Transposition Techniques ECC (Elliptic Curve Cryptography) Digital Signatures & Certificates Block chain Basics & Cryptographic Applications Post-Quantum Cryptography (Introduction) Secure Key Exchange Mechanisms Suggested AI Tools: Copilot, ChatGPT	08	CO3
3	Cyber Security Management & Governance Risk Management (Qualitative & Quantitative) Security Policies & Compliance Cyber Laws (Indian IT Act 2000, Amendments) GDPR & Global Data Protection Laws Cyber Ethics and Privacy Digital Forensics Basics Security Auditing & Governance Secure Software Development Lifecycle (SSDLC) Suggested AI Tools: ChatGPT, Microsoft Copilot, Gemini	07	CO4
4	Secure Communication & Cloud Security Public Key Infrastructure (PKI) SSL/TLS, HTTPS Network Security Protocols (IPSec, VPN) Email Security (PGP, S/MIME) Cloud Security Concepts (AWS, Azure Security Basics) Identity & Access Management (IAM) Multi-Factor Authentication (MFA) DevSecOps Concepts & Secure Deployment Practices	07	CO5



	Suggested AI Tools: Amazon Q Developer, Microsoft Copilot, ChatGPT, Gemini		
5	Advanced Attacks, AI & Countermeasures Advanced Malware (Ransomware, Fileless Malware) Web Attacks (SQL Injection, XSS, CSRF) DoS/DDoS Attacks & Botnets Social Engineering & Phishing (Modern Techniques) AI in Cybersecurity (Threat Detection, Fraud Detection) AI Security & Adversarial Attacks Intrusion Detection & Prevention Systems (IDS/IPS) Suggested AI Tools: Python + AI/ML tools, ChatGPT, Gemini, Google Colab	07	CO5
References Books 1. Bruce Schneier, "Applied Cryptography- Protocols, Algorithms and Source code in C", Algorithms, Wiley India Pvt Ltd, 2nd Edition, ISBN 978-81-265-1368-0. 2. CK Shyamala et al., "Cryptography and Security", Wiley India Pvt. Ltd, ISBN-978-81-265-2285-9. 3. Berouz Forouzan, "Cryptography and Network Security", TMH, 2 edition, ISBN -978-00-707-0208-0. 4. Mark Merkow, "Information Security-Principles and Practices", Pearson Ed., ISBN- 978-81-317-1288-7. 5. Charles P. Pfleeger – <i>Security in Computing</i>			
Text Books 1. William Stallings, "Computer Security: Principles and Practices", Pearson 6Ed, ISBN 978-0-13-335469-0 2. Nina Godbole, Sunit Belapure, "Cyber Security- Understanding Cyber Crimes", Computer Forensics and Legal Perspectives, Wiley India Pvt.Ltd, ISBN- 978-81-265-2179-1			
e Resources – • EC-Council Official platform for CEH (Certified Ethical Hacker) Good for real-world attack techniques • Coursera Courses from Google, IBM, Stanford Includes AI Security, Cloud Security • edX Professional cybersecurity programs Covers cryptography, risk management. • Khan Academy Best for basic cryptography concepts			
Useful websites / Video (998) Best Platform to Learn Cyber Security in 2026 - YouTube Cybrary : Visit Cybrary			
Coursera: Browse Cybersecurity Courses			
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Strength of CO-PO Mapping								
Strength of COs	PO							
	1	2	3	4	5	6	7	8
CO1	3	2	1	1	1	1	-	2
CO2	2	3	2	3	2	1	-	2
CO3	3	2	3	2	3	-	-	1
CO4	2	3	1	2	1	3	1	3
CO5	2	2	3	2	3	1	1	2

Guidelines for Continuous Comprehensive Evaluation		
Sr. No.	Components for Continuous Evaluation	Marks Allotted
1	Group Presentation	6
2	Quiz-1	6
3	Assignment -1	6
4	Quiz-2	6
5	Assignment - 2	6
	Total	30

List of Laboratory Experiments / Assignments		
Sr. No.	Laboratory Experiments / Assignments	CO Mapped
1	Search and list 5 recent cyber-attacks, Identify: type of attack (phishing, ransom ware, etc.) Explain how it could be prevented.	CO1
2	Write a simple program (Python/Java) for Caesar Cipher, Take user input and encrypt it, Decrypt the message.	CO3
3	Generate hash values of given passwords using SHA-256 algorithm and analyse the difference between plaintext and hashed values.	CO4
4	Install Wire shark Capture network packets, Study a real-world cybercrime case and analyse the type of attack, applicable cyber laws, and preventive measures.	CO4
5	Capture and analyze network packets using Wire shark and identify different protocols such as HTTP, HTTPS, and DNS.	CO4
6	Enable and study Multi-Factor Authentication (MFA) in any online platform and analyze its importance in securing user accounts.	CO5

Guidelines for Laboratory Conduction

1. Use of open source software is encouraged.
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3. Operating System recommended :- Windows / Open source Linux or its derivative



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1. The laboratory assignments are to be submitted by student in the form of journal.
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Sr. No.	Components for Continuous Assessment	Marks Allotted
1	R1: Timely Submission	10
2	R2: Understanding	10
3	R3: Clarity of Journal Writing	10
Total Marks:		30
Each assignment will get 30 marks. Average of all assignments is converted into total TW marks		



Prerequisites for the Course: Discrete Mathematics

Course Objectives	Description
1	Introduce mathematical modelling techniques for optimization problems
2	Develop analytical decision-making capability using OR tools
3	Enable application of optimization techniques in computing and IT domains
4	Strengthen algorithmic thinking through resource allocation models
5	Integrate simulation-based reasoning for uncertainty handling
6	Provide exposure to AI-assisted optimization tools

Course Outcomes	Description	Bloom's Level
CO1	Apply optimization techniques to solve resource allocation, scheduling, and operational problems in engineering and computing applications.	3 – Apply
CO2	Analyze optimization problems by formulating appropriate mathematical models to support effective decision-making.	4 – Analyze
CO3	Evaluate alternative strategies and optimization approaches for decision-making in dynamic and competitive environments.	5 – Evaluate
CO4	Develop optimized solutions for project planning, scheduling, and uncertainty analysis using quantitative decision-making techniques.	6 – Create
CO5	Design efficient optimization models to improve the performance and utilization of computing and service systems.	6 – Create

Operations Research is a foundational decision-support discipline used in data science,



logistics optimization, scheduling automation, supply chain analytics, project management, AI planning systems, and business intelligence platforms.

This course introduces students to optimization modeling, algorithmic decision-making, and simulation techniques, enabling them to solve real-world computational decision problems.

Course Contents:

Unit	Contents	Lecture Hours	Cos Mapped
1	Foundations of Operations Research & Linear Programming Introduction to OR, Concept and scope, Role in IT decision systems, Modeling framework Linear Programming: Mathematical formulation, Graphical solution method, Simplex method, Degeneracy and infeasibility, Big-M method, Duality (Introductory), Sensitivity analysis (basic intuition) Applications: Cloud allocation, Bandwidth optimization, Resource scheduling Suggested AI Tools: ChatGPT, Microsoft Copilot, Wolfram Alpha	8	CO2
2	Transportation, Assignment & Network Scheduling Transportation models: NW Corner Rule, Least Cost Method, Vogel's Approximation Method, Optimality testing (MODI method), Unbalanced transportation models, Transshipment models Assignment problems: Hungarian Method, Unbalanced assignment cases, Maximization cases Applications: Delivery optimization, Server allocation Task scheduling Suggested AI Tools: ChatGPT, Microsoft Copilot, Google Gemini	7	CO1
3	Game Theory for Strategic Decision Making Game theory concepts: Two-person zero-sum games, Saddle point, Maximin–Minimax principle, Mixed strategies, Graphical solution methods, LP approach for game solving Applications: Cybersecurity defense strategies, Competitive pricing, Resource conflict resolution Suggested AI Tools: ChatGPT, Claude, Google Gemini	6	CO3
4	Project Management & Decision Simulation Network scheduling: Fulkerson's rule, CPM, PERT, Float analysis, Critical path identification, Crashing techniques Simulation: Concept of simulation, Monte Carlo simulation, Inventory simulation, Queue simulation overview Applications: Software release planning, Agile sprint estimation, DevOps pipelines Suggested AI Tools: ChatGPT, Microsoft Copilot, Napkin AI	8	CO4



5	Queuing Models & Sequencing Optimization Queuing systems: Structure of queue systems ,Kendall's notation ,M/M/1 model ,M/M/c model ,Sequencing models: n jobs – 2 machines ,n jobs – 3 machines , 2 jobs – m machines ,Practical scheduling interpretation Applications: Processor scheduling, Network packet management, Cloud load balancing Suggested AI Tools: ChatGPT, Claude, Microsoft Copilot	7	CO5
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References Books

1. Hillier & Lieberman – Introduction to Operations Research
2. Ravindran – Operations Research Theory & Practice
3. Wayne Winston – Practical Management Science

Text Books

1. Hamdy A. Taha – Operations Research: An Introduction
2. J. K. Sharma – Operations Research Theory and Applications
3. Winston – Operations Research Applications and Algorithms

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Strength of CO-PO Mapping								
Strength of COs	PO							
	1	2	3	4	5	6	7	8
CO 1	3	3	2	2	-	-	1	1
CO 2	3	2	3	3	1	2	-	1
CO 3	2	3	3	2	1	2	2	2
CO 4	2	3	3	3	2	3	1	2
CO 5	2	3	3	3	2	3	2	3

Guidelines for Continuous Comprehensive Evaluation of Theory Course

Sr. No.	Components for Continuous Comprehensive Evaluation	Marks Allotted
1	Assignment 1	6
2	Quiz 1	6
3	Case Study	6
4	Quiz 2	6
5	Assignment 2	6
	Total	30



Prerequisites for the Course: Nil

Course Objectives	Description
1	To introduce basic concepts of system programming
2	To learn and understand the concept of operating system and management policies adopted by operating system as pertaining with processes
3	To provide the knowledge of basic concepts towards concurrency control and deadlock.
4	To get familiar with different approaches of memory management
5	To understand structure and organization of file system and disk management

Course Outcomes	Description	Bloom's Level
CO1	Apply the principles of system software to analyze the functioning of assemblers, macro processors, compilers in program translation and execution.	3-Apply
CO2	Analyze operating system architecture, process management, CPU scheduling algorithms, and system calls to evaluate process execution and resource utilization.	4-Analyze
CO3	Evaluate synchronization mechanisms and deadlock handling techniques to select appropriate solutions for concurrent process execution.	5 - Evaluate
CO4	Analyze memory management techniques, virtual memory organization, and page replacement policies to determine efficient memory utilization.	4-Analyze
CO5	Differentiate file management and disk scheduling methods	4-Analyze

Operating Systems provide the foundation for managing computer hardware and software resources, enabling efficient execution of applications. This course covers system programming, process management, memory management, concurrency, deadlocks, file systems, and I/O management, which are essential concepts in modern computing. It develops the skills required to understand and optimize system performance, resource allocation, and multitasking. The knowledge gained is highly relevant for careers in software development, system administration, cloud computing, embedded systems, and cybersecurity.

Course Contents:



Unit	Contents	Lecture Hours	Cos Mapped
1	Components of System Software, Assemblers: System program and application program, Features of assembly language, types of statement, Advanced assembler directive, Structure of an assembler, Data structures used, Two-Pass Assemblers, One-Pass Assemblers, Forward reference problem, Cross assembler. Macro Processors: Concept and need, Features of MASM (No design aspects expected) Compiler : Introduction to Compilers, Structure of compiler – Lexical analysis, syntax analysis, semantic analysis, intermediate code generation, code optimization, code generation, Cross compiler Recommended AI Tool : AI-assisted Code Generation for Assembly Programming - Workik (https://workik.com/ai-powered-assembly-code-generator)	7	CO1
2	Operating Systems: Introduction, Operating system functions, Types of operating system, Real Time Systems, Architecture System Calls, interrupt mechanism . Modern Operating System : Windows vs Linux Kernel Android OS Process Management Process Concept, Process states, Process control block, CPU scheduler, Preemptive and Non-preemptive Scheduling, Scheduling criteria, Types of scheduling algorithms: First Come First Served, Shortest Job Scheduling, Round Robin, Priority, Multilevel queue scheduling and Multilevel feedback queue scheduling Recommended AI Tool : CPU – OS Simulator (https://teach-sim.com/os/)	7	CO2
3	Concurrency Control: Critical section problem, Concurrency and Race Conditions, Mutual exclusion requirements, Software and hardware solutions, Semaphores, Monitors, Classical IPC problems and solutions. Deadlock : Characterization, Detection, Recovery, Avoidance and Prevention Recommended AI Tool : GitHub Copilot	8	CO3
4	Memory management: Contiguous and non-contiguous, Memory partitioning: Fixed and Variable Partitioning, Swapping and overlap swapping, Thrashing, Paging, Segmentation and Demand Paging, Memory Allocation: Allocation Strategies (First Fit, Best Fit, and Worst Fit), Page Replacement Policies (FIFO, LRU, Optimal, Other Strategies)	7	CO4



	Recommended AI Tool : Claude AI		
5	File Management: Concept, Access methods, Directory Structure, Protection, File system implementation, Directory implementation, Allocation methods, Free space management, efficiency and performance. I/O Management : Disk structure , disk scheduling, Interrupt mechanism	7	CO5

References Books

1. Dhamdhare D., “Systems Programming and Operating Systems”, McGraw Hill, ISBN 0 – 07 – 463579 – 4
2. Randal Bryant and David O’Hallaron, “Computer Systems: A Programmer’s Perspective” , Pearson, ISBN 10: 0-13-610804-0
3. Stallings W., “Operating Systems”, 6th Edition, Prentice Hall, ISBN-978-81-317-2528-3.
4. John. R. Levine, Tony Mason and Doug Brown, “Lex and Yacc”, O’Reilly, 1998, ISBN: 1- 56592-000-7

Text Books

1. John Donovan, “System Programming”, McGraw Hill, ISBN 978-0–07-460482-3.
2. Silberschatz, Galvin, Gagne, “Operating System Principles”, 9th Edition, Wiley, ISBN 978-1- 118-06333-0

e Resources

- <https://nptel.ac.in/>
- <https://www.geeksforgeeks.org/operating-systems/>
- https://www.tutorialspoint.com/operating_system/index.htm
- <https://pages.cs.wisc.edu/~remzi/OSTEP/>
- <https://teach-sim.com/os/>

Useful websites / Video

- <https://www.youtube.com/watch?v=26QPDBe-NB8>
- <https://www.youtube.com/watch?v=vBURt97EkA>
- <https://www.youtube.com/watch?v=3obEP8eLsCw>
- <https://www.youtube.com/watch?v=6gS1TH6xTAY>
- https://www.youtube.com/watch?v=FBB4e_QwPAg
- https://www.youtube.com/watch?v=KqQe1nNK6_0
- <https://www.youtube.com/watch?v=RozoeWzT7IM>
- <https://www.youtube.com/watch?v=YgK4q4Jm5AU>
- <https://www.youtube.com/watch?v=ZtqBQ68cfJc>

Strength of CO - PO/PSO Mapping (Sample): Attainment of a PO/PSO depends both on the attainment levels of associated COs of courses and the strengths to which it is mapped

- Each Course Outcome addresses a sub-set of POs and PSOs to varying levels (strengths: 1- Low, 2 – Medium, 3 - Strong).

Strength of CO-PO Mapping								
Strength of COs	PO							
	1	2	3	4	5	6	7	8
CO 1	3	2	-	2	-	-	-	1
CO 2	3	3	2	2	-	-	-	1
CO 3	2	3	2	2	2	-	-	1



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CO 4	3	3	2	2	-	-	-	1	
CO 5	2	2	1	2	-	-	1	1	

Guidelines for Continuous Comprehensive Evaluation of Theory Course

Sr. No.	Components for Continuous Comprehensive Evaluation	Marks Allotted
1	Assignment 1	6
2	Quiz 1	6
3	Group Presentation	6
4	Quiz 2	6
5	Assignment 2	6
	Total	30



Course Code		2609514C						
Course Name		Emerging Technologies						
Type of Course		Major Elective						
Teaching Scheme and Credits Weekly Working Hrs		TH(Hrs.)		TU(Hrs.)		PR(Hrs.)		Total Credits
		3		-		-		3
Assessment Scheme (Marks)		CCE	TW	PR	OR	ISE	ESE	Total (Marks)
		30	-	-	-	20	50	100
Prerequisites for the Course: -								
The course aims to:								
Course Objectives		Description						
1		To understand the concepts, architecture, and applications of Internet of Things (IoT)						
2		To learn the fundamentals and working of Blockchain Technology and its real-world uses						
3		To explore Robotic Process Automation (RPA) for automating business processes						
4		To study the principles and applications of Edge Computing for real-time data processing						
5		To understand the importance of Sustainability and Green Computing in modern IT systems						
On completion of the course, learner will be able to–								
Course Outcomes		Description					Bloom’s Level	
CO1		Apply IoT concepts and applications.					3 – Apply	
CO2		Analyze blockchain architecture and applications.					4 – Analyze	
CO3		Apply RPA for business automation.					3 – Apply	
CO4		Evaluate edge computing systems.					5 – Evaluate	
CO5		Create sustainable computing solutions.					6 – Create	
Course context, Relevance, Practical Significance: This course introduces students to emerging technologies such as IoT, Blockchain, Robotic Process Automation (RPA), Edge Computing, and Sustainable Computing, enabling them to understand modern digital transformation and intelligent systems. The course aligns with Industry 4.0 and Industry 5.0 trends by providing knowledge of cutting-edge technologies widely adopted in smart industries, automation, secure digital systems, and sustainable IT practices. Students gain hands-on exposure to industry-relevant tools and applications, enabling them to design smart solutions, automate business processes, develop secure decentralized applications, implement edge-based systems, and adopt sustainable computing practices for real-world problem solving.								
Course Contents:								
Unit	Contents						Lecture Hours	Cos Mapped



1	Internet of Things (IoT) Introduction to IoT and its architecture, Components: Sensors, actuators, communication protocols, IoT communication models and platforms, Applications: Smart homes, healthcare, agriculture, smart cities, Smart Manufacturing, Challenges: Security, privacy, scalability, Case studies of IoT-based systems. Suggested AI Tools: Arduino IDE, Wokwi Simulator, Node-RED, ChatGPT	07	CO1
2	Blockchain Technology Introduction to Blockchain and distributed ledger, Structure: Blocks, hashing, cryptography basics, Types of blockchains: Public, private, consortium, Smart contracts and cryptocurrencies, Applications: Finance, supply chain, healthcare, Limitations and security concerns. Suggested AI Tools: Ethereum Remix IDE, Ganache, ChatGPT, GitHub	08	CO2
3	Robotic Process Automation (RPA) Introduction to RPA and automation concepts, RPA tools and architecture, Business process automation using bots, Applications in banking, HR, and customer service, Benefits and challenges of RPA, Case studies of RPA implementation. Suggested AI Tools: UiPath Community Edition, Microsoft Power Automate, ChatGPT, Canva	07	CO3
4	Edge Computing Introduction to Edge Computing, Difference between cloud and edge computing, Edge architecture and components, Real-time data processing and latency reduction, Applications: IoT, autonomous vehicles, smart systems, Digital Twins, Challenges and future trends. Suggested AI Tools: Raspberry Pi, Edge Impulse, Google Colab, Python	07	CO4
5	Sustainable Computing & Industry 5.0 Introduction to Sustainability in Technology, Green computing principles, Energy-efficient systems and data centers, E-waste management and environmental impact, Sustainable IT practices in organizations, Role of technology in achieving sustainable development, Industry 5.0 Applications. Suggested AI Tools: ChatGPT, Canva, Google Colab, Microsoft Power BI	07	CO5

References Books

1. Arshdeep Bahga and Vijay Madisetti, “*Internet of Things: A Hands-On Approach*”, 1st Edition, Universities Press
2. Mahadev Satyanarayanan, “*The Emergence of Edge Computing*”, IEEE Publications
3. San Murugesan and G. R. Gangadharan, “*Harnessing Green IT: Principles and Practices*”, Wiley
4. Daniel Drescher, “*Blockchain Basics: A Non-Technical Introduction*”, 1st Edition, Apress



5. Mary Lacity and Leslie Willcocks, “*Robotic Process Automation and Cognitive Automation*”, SB Publishing

Text Books

1. Samuel Greengard, “*The Internet of Things*”, MIT Press
2. Alok Mani Tripathi, “*Learning Robotic Process Automation*”, Packt Publishing
3. Imran Bashir, “*Mastering Blockchain*”, 2nd Edition, Packt Publishing

e Resources

- Coursera – Courses on IoT, Blockchain, AI
- edX – Technology and sustainability courses
- IBM Learning resources on Blockchain & AI

Useful websites / Video

- <https://www.youtube.com/watch?v=QSIPNhOiMoE>
- <https://www.youtube.com/watch?v=6mBO2vqLv38>
- https://www.youtube.com/watch?v=SSo_EIwHSd4
- <https://www.youtube.com/watch?v=qOVAbKKSH10>
- <https://www.youtube.com/watch?v=JkzAuqB8s5E>
- <https://www.youtube.com/watch?v=8dXrjX3nR4g>
- <https://www.youtube.com/watch?v=Z3k5ZrG3M1A>
- <https://www.youtube.com/watch?v=8Z28flTEVnc>
- <https://www.youtube.com/watch?v=1M7hZP7X7wE>
- <https://www.youtube.com/watch?v=3v6dCP0z7dE>

Strength of CO - PO/PSO Mapping (Sample): Attainment of a PO/PSO depends both on the attainment levels of associated COs of courses and the strengths to which it is mapped

- Each Course Outcome addresses a sub-set of POs and PSOs to varying levels (strengths: 1- Low, 2 – Medium, 3 - Strong).

Strength of COs	Strength of CO-PO Mapping							
	PO							
	1	2	3	4	5	6	7	8
CO 1	2	2	1	2	-	-	-	1
CO 2	2	3	2	2	-	-	2	1
CO 3	2	2	3	3	2	2	1	-
CO 4	3	3	2	3	1	-	-	2
CO 5	1	2	3	2	2	2	3	3

Guidelines for Continuous Comprehensive Evaluation of Theory Course

Sr. No.	Components for Continuous Comprehensive Evaluation	Marks Allotted
1	Assignment 1	6
2	Quiz 1	6
3	Group Presentation	6
4	Quiz 2	6
5	Assignment 2	6
	Total	30



Course Code	2609515						
Course Name	Management Information System						
Type of Course	Humanities, Social Science and Management						
Teaching Scheme and Credits	TH(Hrs.)	TU(Hrs.)		PR(Hrs.)		Total Credits	
Weekly Working Hrs	3	-		-		3	
Assessment Scheme	CCE	TW	PR	OR	ISE	ESE	Total (Marks)
(Marks)	30	-	-	-	20	50	100

Prerequisites for the Course: NIL

The course aims to:

Course Objectives	Description
1	To learn the fundamental concepts, types, capabilities, and organizational applications of Information Systems and understand modern concepts such as Cloud, AI, and Cybersecurity.
2	To understand Information Technology strategies, control mechanisms, and different approaches to Information Systems planning for effective organizational management.
3	To understand functional information subsystems, ERP, digital transformation, analytics, and the role of Information Systems in leadership and team management.
4	To study Decision Support Systems, Executive Information Systems, Group Decision Support Systems, and Expert Systems for effective organizational decision-making.
5	To understand Business Process Reengineering, Robotic Process Automation, and modern Information Systems approaches for business process optimization.

On completion of the course, learner will be able to–

Course Outcomes	Description	Bloom's Level
CO1	Use the concepts of Information Systems to identify their basic components, capabilities, types, and organizational applications, including modern IS concepts such as cloud computing, AI, and cybersecurity.	03-Apply
CO2	Examine information technology strategies, control mechanisms, planning models, and modern approaches to Information Systems planning for effective organizational management.	04-Analyze
CO3	Analyze functional information subsystems, ERP, SAP, CRM, digital transformation, analytics, and leadership and team management concepts to support organizational performance and decision-making.	04-Analyze
CO4	Assess Decision Support Systems (DSS), Executive Information Systems (EIS), Group Decision Support Systems (GDSS), and	04-Analyze



	Expert Systems to support effective organizational decision-making.	
CO5	Evaluate Business Process Reengineering (BPR), Robotic Process Automation (RPA), and modern information-system approaches for business process optimization and organizational improvement.	05 – Evaluate

Course context, Relevance, Practical Significance:

This course provides an understanding of Information Systems (IS) and their role in organizations, including types like TPS, MIS, DSS, and EIS. It covers modern concepts such as cloud computing, AI, data-driven decision making, and cyber security. The course also focuses on IS planning, functional subsystems, and analytics in business areas. Advanced topics like DSS, BI, and RPA are included to improve decision-making and process efficiency. Overall, it helps students apply IS concepts in real-world organizational and business environments.

Course Contents:

Unit	Contents	Lecture Hours	Cos Mapped
1	Fundamentals and Types of Information Systems Information Systems in Organizations: Information Systems in organizations and their capabilities, Foundation concepts of Information Systems, Business Applications of Information Systems, Role of Management in Information Systems, Types of Information Systems, Modern Information Systems Concepts: Cloud-based Information Systems, SaaS and PaaS – Basic concepts AI applications: Chatbots and Recommendation Systems, Data-driven Decision Making, Cybersecurity Basics in Information Systems, Recommended AI/Technology Tools: Apache Superset, Rasa, OpenMetadata	07	CO1
2	Information Technology, Control and Strategic Planning IS Planning Competing with Information Technology Systems: Definition of Information Technology Systems, Effectiveness and Efficiency, Strategic Use of IT in Organizations Control in Systems: Concept of Control in Information Systems, Feedback Control, Feedforward Control, Applications of Control Mechanisms in Organizations Models for Information Systems Management: Organization Model, Strategic Planning Model, Management Control Model IS Planning: Types of Planning (Strategic Planning, Tactical Planning), Operational Planning, Traditional Strategy	07	CO2
3	Functional Information Systems, ERP, SAP and CRM Modern Planning Approaches: Digital Transformation Strategy, Agile Planning – Basics, Scrum Concepts	08	CO3



	Enterprise Resource Planning (ERP): Concept and Importance of ERP, Characteristics and Benefits of ERP , Overview, Introduction to SAP ERP and its Business Applications, Role of SAP in Enterprise Resource Planning Customer Relationship Management (CRM): Concept an, Components of CRM, Operational, Analytical and Collaborative CRM, CRM Applications in Marketing and Sales Recommended Technology Tools: ERPNext, SAP ERP (Conceptual Study), CRM Platforms		
4	Decision Support, Executive and Group Decision Systems Decision Support Systems (DSS) and Executive Information Systems (EIS): Overview of DSS and EIS, Capabilities of DSS, Models of DSS, Components and Architecture of DSS Group Decision Making: Characteristics of Group Decision Making, Techniques of Group Decision Making, Group Decision Support Systems (GDSS) Expert Systems (ES): Overview of Expert Systems, Capabilities of Expert Systems, Architecture of Expert Systems, Applications of Expert Systems	7	CO4
5	Business Process Management and Modern Process Enhancement Business Process Reengineering (BPR): Overview, Business Processes, Process Models, Modern Process Enhancement: Robotic Process Automation (RPA), Concept and Applications of RPA, Integration of MIS in Business Process Optimization, Automation of Business Processes Applications and Case Studies: Banking Information Systems, Applications of RPA in Business Processes Recommended AI/Technology Tools: KNIME Analytics Platform, Orange Data Mining, Apache NiFi	7	CO5

References Books

1. Ralph M Stair and George W Reynolds," Principles of Information Systems", 12 Edition, Thomson, 2015
2. S. Sadagopan, "Management Information Systems", 2nd Edition, PHI
3. Barbara McNurlin et al, "IS Management in practice", Pearson Education, 5th edition
4. Zwass, Vladimir, "Foundations of information systems" Irwin/McGraw Hill, 1997
5. Laudon, Kenneth C., and Jane P. Laudon. "Management information systems: managing the digital firm." New Jersey 8 (2004)

Text Books



1. James A O'Brien and George M Marakas , “Management Information Systems”, 9 Edition, Tata McGraw Hill, 2009.
2. James Obrien and George Maracus, “Management information Systems”, McGrawHill India, 10th edition.
3. Haag, Dawkins, “Management information Systems for Information Age” , McGrawHill India, 6 th edition.

e Resources

- <https://www.coursera.org/learn/ai-for-everyone>

Useful websites / Video

- <https://www.youtube.com/watch?v=ACHfIfQ4gjw>
- <https://www.youtube.com/watch?v=nQ4Q3iN7TMM>
- <https://www.youtube.com/watch?v=ox--ILABHdw>
- <https://www.youtube.com/watch?v=114DipNd1n8>
- <https://www.youtube.com/watch?v=v-jAf7L2Uak>
- <https://www.youtube.com/watch?v=UEbw7dIOg0g>
- <https://www.youtube.com/shorts/Z6q5EOJE1QE>

Strength of CO - PO/PSO Mapping (Sample): Attainment of a PO/PSO depends both on the attainment levels of associated COs of courses and the strengths to which it is mapped

- Each Course Outcome addresses a sub-set of POs and PSOs to varying levels (strengths: 1- Low, 2 – Medium, 3 - Strong).

Strength of CO-PO Mapping								
Strength of COs	PO							
	1	2	3	4	5	6	7	8
CO 1	3	3	–	2	–	–	–	1
CO 2	3	3	2	3	2	2	1	3
CO 3	3	3	2	3	3	2	1	3
CO 4	3	3	3	3	2	2	1	3
CO 5	3	3	3	3	2	3	2	3

Guidelines for Continuous Comprehensive Evaluation of Theory Course

Sr. No.	Components for Continuous Comprehensive Evaluation	Marks Allotted
1	Assignment-1	6
2	Quiz-1	6
3	Case Study	6
4	Quiz-2	6
5	Assignment-2	6
	Total	30



Course Code	2609517						
Course Name	On Job Training / Industrial Internship						
Type of Course	On Job Training						
Teaching Scheme and Credits	TH(Hrs.)	TU(Hrs.)		PR(Hrs.)		Total Credits	
Weekly Working Hrs	-	-		-		02	
Assessment Scheme	CCE	TW	PR	OR	TW	OR	Total (Marks)
(Marks)	-	-	-	-	25	25	50

Prerequisites for the Course: -

The course aims to:

Course Objectives	Description
1	Provide exposure to real-world IT industry environments and practices
2	Develop practical problem-solving ability through hands-on industrial assignments
3	Strengthen technical competency using modern tools and technologies
4	Enhance teamwork, collaboration, and professional communication skills
5	Familiarize students with industry documentation standards and workflows
6	Bridge the gap between academic learning and industry expectations
7	Encourage professional ethics, responsibility, and workplace discipline

On completion of the course, learner will be able to–

Course Outcomes	Description	Bloom's Level
CO1	Apply domain knowledge to understand real-time industrial problems	3-Apply
CO2	Use modern industry tools, platforms, and technologies effectively	3-Apply
CO3	Demonstrate teamwork and professional communication in industry environment	3-Apply
CO4	Prepare technical documentation following SDLC practices	3-Apply
CO5	Analyze assigned tasks and propose feasible technical solutions	4-Analyze

Course context, Relevance, Practical Significance:

The On Job Training / Industry Internship course is designed to provide students with structured exposure to real industrial environments. It enables students to apply theoretical knowledge gained during the first semester into practical applications through industry-based assignments, live projects, maintenance tasks, or technical training modules.

This course acts as a bridge between academic curriculum and professional practice, preparing students for advanced specialization and final-year project work. This course is highly relevant because it:

- Aligns academic learning with industry expectations
- Enhances employability readiness
- Provides exposure to current tools, technologies, and workflows
- Develops team collaboration skills
- Strengthens professional communication



- Introduces students to organizational culture and ethics
- Supports preparation for final-year major project work

Course Contents:

- The department shall assign faculty mentors to guide and monitor students throughout the internship.
- Students shall complete 4 week of IT-related training/work/project activity in an organization.
- Internship may be completed in offline / online / hybrid mode.
- Students may begin the internship after Semester-I examination (winter break) , OR after Semester-II examination (summer break)

The assigned work may include:

- Software development
- Web/mobile application development
- Database implementation
- Testing activities
- Maintenance of existing systems
- Technical documentation
- Data analysis assignments
- Cloud / AI / Cybersecurity exposure tasks
- Equivalent IT-related activities

Students must:

- Maintain a weekly progress report
- Get verification from industry mentor
- Submit reports to faculty mentor
- Prepare final internship documentation
- Deliver final presentation before evaluation panel

Evaluation Scheme

Internal Evaluation (Term Work – 25 Marks)

Based on:

- Weekly progress reports
- Mentor feedback
- Internship diary maintenance
- Participation and discipline
- Technical learning outcomes

External Evaluation (Oral / Presentation – 25 Marks)

Based on:

- Final presentation
- Internship report quality
- Understanding of assigned work
- Technical knowledge gained
- Viva-voce performance

Strength of CO - PO/PSO Mapping (Sample): Attainment of a PO/PSO depends both on the attainment levels of associated COs of courses and the strengths to which it is mapped

- Each Course Outcome addresses a sub-set of POs and PSOs to varying levels (strengths: 1- Low, 2 – Medium, 3 - Strong).



Strength of CO-PO Mapping								
Strength of COs	PO							
	1	2	3	4	5	6	7	8
CO 1	2	3	1	2	–	–	–	2
CO 2	1	2	2	3	1	–	–	3
CO 3	2	3	2	2	–	1	–	2
CO 4	–	–	–	1	3	2	1	2
CO 5	1	2	2	2	2	2	1	1



Course Code	2609518						
Course Name	MOOC-II on Human Rights						
Type of Course	Ability Enhancement Course						
Teaching Scheme and Credits	TH(Hrs.)	TU(Hrs.)		PR(Hrs.)		Total Credits	
Weekly Working Hrs	01	-		-		01	
Assessment Scheme	CCE	TW	PR	OR	ISE	ESE	Total (Marks)
(Marks)	25	-	-	-	-	-	25

Prerequisites for the Course:

1. Basic knowledge of computing concepts
2. Familiarity with internet-based learning platforms
3. Interest in learning emerging technologies

The course aims to:

Course Objectives	Description
1	To introduce students to the concepts and principles of Human Rights and Constitutional Values.
2	To create awareness about fundamental rights, duties, equality, and social justice.
3	To encourage ethical decision-making and responsible citizenship through online learning.
4	To promote lifelong learning through recognized MOOC platforms in the area of Human Rights and related disciplines.

On completion of the course, learner will be able to–

Course Outcomes	Description	Bloom's Level
CO1	Explain the basic concepts, principles, and significance of Human Rights.	2-Understand
CO2	Apply constitutional values, ethical principles, and human rights in personal and professional life.	3-Apply
CO3	Demonstrate awareness of social responsibility, equality, and inclusive practices.	3-Apply
CO4	Analyze contemporary human rights issues and propose ethical solutions.	4-Analyze

Course context, Relevance, Practical Significance:

Human Rights education develops awareness of equality, dignity, justice, and social responsibility among learners. Through MOOCs offered by recognized platforms such as SWAYAM, NPTEL, IGNOU, and international universities, students gain knowledge about constitutional values, gender equality, child rights, environmental rights, digital rights, and ethical responsibilities. These courses help learners become responsible citizens, ethical professionals, and socially conscious individuals capable of contributing positively to society.

Course Contents:

MOOCs (Massive Open Online Courses)



This course provides students with an opportunity to enhance their understanding of Human Rights, Constitutional Values, Ethics, and Social Responsibility through online learning platforms. MOOCs enable learners to study from reputed institutions and experts while developing awareness of human dignity, equality, justice, and democratic values.

MOOCs are structured online learning programs that typically include video lectures, reading materials, quizzes, assignments, and discussion forums to enhance learning outcomes.

Key Features of MOOCs

- Massive — Large number of learners can enroll simultaneously
- Open — Courses are accessible to anyone without admission restrictions
- Online — Courses are delivered through internet platforms
- Course — Focused on specific skills and knowledge domains

Learning Platforms

SWAYAM is an initiative of the Government of India providing quality education through online courses from premier institutions.

NPTEL offers multidisciplinary courses from IITs and IISc, including humanities, social sciences, ethics, and constitutional studies.

IGNOU, Coursera, edX, FutureLearn, and similar platforms provide courses on Human Rights, Ethics, Citizenship, Law, and Sustainable Development.

Students are required to enroll in any one MOOC course from recognized platforms and complete it successfully. The selected course should be related to Human Rights, Constitutional Values, Ethics, Law, Citizenship, or Social Responsibility.

Suggested List (New Technology Based):

- Human Rights Law and Criminal Justice
- Human Rights and Gender Justice
- Glimpses of Indian Social Legislation and Social Welfare
- Development Administration
- Legal Theory and Law Relating to Women
- Issues in Contemporary World
- Any other course suggested by Institute

References Books

- 1.Human Rights – Dr. H. O. Agarwal
- 2.Human Rights in India – South Asia Human Rights Documentation Centre
- 3.Introduction to the Constitution of India – D. D. Basu
- 4.National Human Rights Commission (NHRC) Publications

e Resources

- <https://swayam.gov.in>
- <https://onlinecourses.nptel.ac.in>



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- <https://coursera.org>
- <https://edx.org>